The Foundrymen's Own Magazine

American Foundryman

34 Open Model Foundry

42 Malleable Melting Control

47 Slag Attacks Refractories

51 Conveying Core Sand

56 Mechanized Casting

60 U-505 Bronze Plaque

62 Pangborn Anniversary

72 Regional Programs

OCTOBER

1954

Type QT Lectromelt Furnace at Carondelet Foundry Company, St. Louis, Missouri

"Our Lectromelt* Furnace gives us the Versatility needed in our jobbing foundry"

"Top-charging doesn't give our Lectromelt Furnace much time to loaf, boosting its productive time and holding down labor costs," reports Carondelet Foundry Company.

"Its versatility lets us shift easily from one type product to another . . . from high strength gray irons for pressure castings, to special steels for heat resistance, corrosion and abrasion resistance. In 10 minutes we make a spectrographic, prepouring analysis, permitting us to adjust each heat to meet specifications.

"Our Lectromelt Furnace is new, but already it's proved its worth."

If your business involves melting, smelting, refining or reduction, it will pay you to investigate what Lectromelt Furnace Equipment will do for you. For Catalog No. 9, write: Pittsburgh Lectromelt Furnace Corporation, 316 32nd Street, Pittsburgh 30, Pa.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

MOORE RAPID

WHEN YOU MELT...

Lectromelt

*REG. T. M. U. S. PAT. OFF.

For more data, circle No. 535 on postage-free Reader Service card on p. 17 or 18

FEDERAL ADDITIVES FOR BETTER SAND PREPARATION

(May be used as dry additives or in slurry)

Here's a striking verification of the truth in the old saying that "good things come in threes." For here are three sand additives that really are good! Additives that produce the exact sand characteristics necessary for good, dependable sand preparation.

You can vary the amount of Federal's GREEN BOND Bentonite added to your sand (*Pulverized or GB100 Granular for dry additives — #1200 Slurry Grade Granular for slurry use*) to provide the correct green and dry strengths for each type of work. Federal's CROWN HILL Seacoal gives the desired carbon content. And the addition of Federal SAND STABILIZER creates better flowability, regardless of compression strength—thus making for more uniform, faster ramming. It also provides a wider range of *safe* moisture content and better shakeout—permitting maximum sand reclamation. Federal's "three" really do an outstanding job of promoting better and easier sand control—economically!

And if this isn't enough to convince you—just consider that these three additives will cost you *less than $1.00 per ton of castings produced!* A new bulletin tells all about Federal's "three good things." Write for your copy today!

IMPORTANT
FOR SLURRY USERS!

If you use the slurry system of sand bonding, you'll want to learn about Federal's #1200 Slurry Grade, Granulated Green Bond Bentonite ... and how it's used with Crown Hill Seacoal and Federal Sand Stabilizer to make the perfect slurry. We'll gladly consult with you or send complete information.

FEDERAL

Make your foundry a better place in which to work!

The **FEDERAL FOUNDRY SUPPLY** *Company*

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THIS IS THE FORTIETH MOLD . . .

from one application of

STEVENS LIQUID PARTING

That's normal experience in a large Midwest foundry that averages 1200 tons of castings per month. They use Stevens Liquid Parting for all of their molding operations. Here's why:

- Stevens Liquid Parting gives up to 60 molds from one application.
- Patterns are left clean, with no adhering sand.
- Molders save time . . . increase production with each mold because they do not have to shake parting on the patterns each time.
- Molds always give smooth castings since sand separates cleanly.

Stevens Liquid Parting can be the answer to your molding problems. Why don't you try Stevens Liquid Parting?

Write for a sample – or call your Stevens representative today.

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STEVENS
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EVERYTHING FOR A FOUNDRY
DETROIT 14, MICHIGAN

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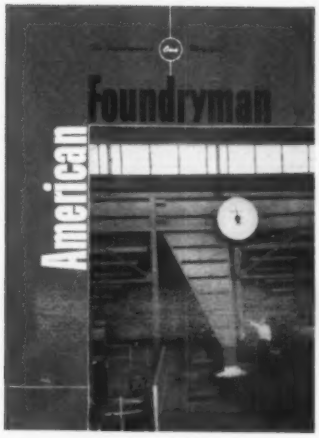
American Foundryman

Volume 26 *October 1954* *Number 4*

Published by American Foundrymen's Society



Fairbanks-Morse scale next to the cupola weighs up to 5000 pounds of coke, steel scrap and pig iron and limestone which goes into the fiery furnace of the cupolas to make molten metal for castings. The huge bins on either side of the scale are called "working" coke bins. Conveyors discharge coke from them onto the platform of the scale, (metal area in foreground). An overhead cab-operated bridge-type crane brings scrap iron from bins on left and pig iron from bins not shown. The large dial is for the benefit of the crane operator. The limestone can be seen discharging from small center bin onto the scale platform. On left is a scale dial (vertical piece topped by round object) for benefit of scale operator. Coke limestone and iron are dumped down hole in scale platform into the car of a "skip-hoist" partially shown at left which takes it up about two stories to charge the cupolas. Operating the hoist scale is John Baker.

In This Issue...

Open Model Gray Iron Foundry 34
H. F. Scobie

Malleable Melting Control 42
L. E. Emery

How Slag Attacks Refractories 47
D. Dixon

Conveying Core Sand 51
J. H. Kauffman

Mechanized Permanent Mold Casting 56
H. F. Scobie

Commemorate Sub Capture in Bronze 60

Celebrate Pangborn 50th Anniversary 62

1954 Apprentice Contest Sets Records 64

Announce Regional Programs 72

Departments...

Products and Processes 10

Free Foundry Information 18

Letters to the Editor 24

Foundrymen in the News 26

Talk of the Industry 33

Foundry Facts 67

Foundry Trade News 70

Obituaries 76

Chapter News 82

Casting Through the Ages 88

Chapter Meetings 99

Rammed Up and Poured 102

Classified Advertising 103

Advertisers and Their Agencies 104

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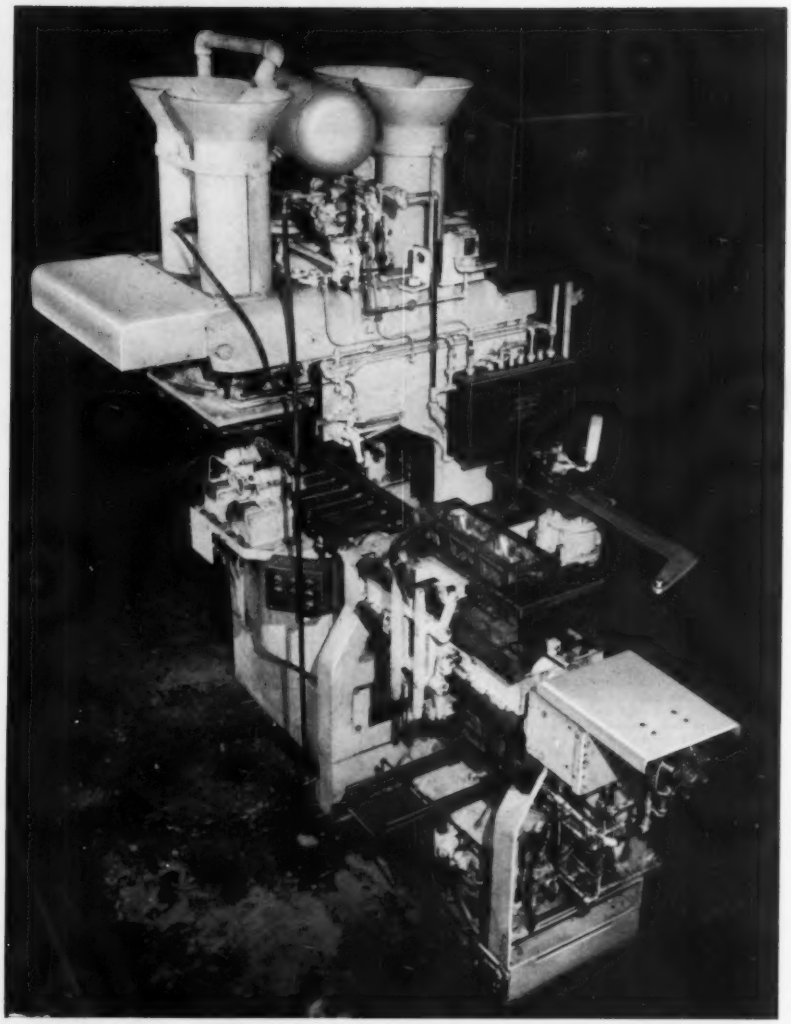
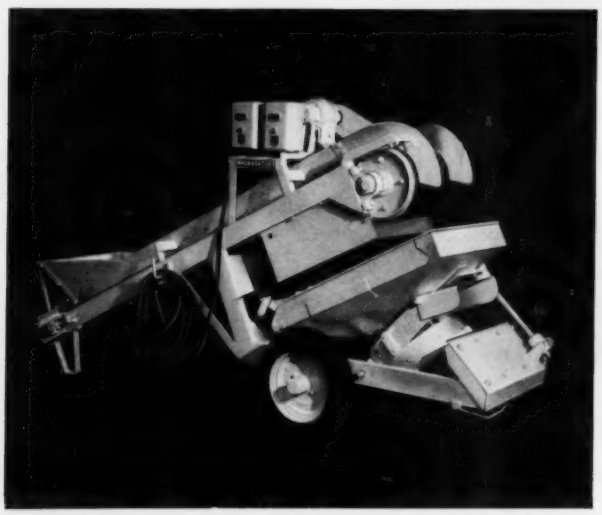
(Advertisement)

EQUIPMENT IN THE NEWS



A NEW HIGH SPEED TRUNNION-TYPE ROL-A-COR will speed rollover, draw, and other handling of production and semi-production cores. Used here in conjunction with a Champion CB-18 dual-head Blomatic Core Blower, the TR Rol-A-Cor handles two different boxes blown under two magazines on the blower. The total time cycle for clamping, blowing, unclamping, indexing, rollover, draw, and elevation of core to handling height is only 15 seconds. *For full data write to Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.*



MORE EFFECTIVE SAND CONDITIONING for the small foundry is now available at a cost well within even the most moderate budget. Reports on the new low priced Magnarator, which offers convenient hopper loading, magnetic separation, thorough screening and full aeration, indicate that up to 20 tons an hour can be handled by this portable machine. *Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill., will provide full details.*

REALLY PORTABLE MULLING EQUIPMENT offers the foundry core room maximum flexibility at great savings. The Krause Foundry Co. uses their Mulbaro with four mulling barrows. The sand is loaded only once—when it is put into the barrows—and is mulled, delivered, and used from the same barrows. The mulling mechanism is utilized more fully *with no time lost for sand handling. Get all the facts from Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.*

For more data, circle No. 538 on postage-free Reader Service card on p. 17 or 18

SMALL FOUNDRIES TOO can get all of the advantages of fully mulled and conditioned molding sand. This small, extremely compact Speedmullor-Preparator Unit is ideal for the small shop that needs complete sand preparation and resultant quality control. Six different low-cost units with capacities of from 7 to 70 tons per hour are available. *Send for all of the facts: Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.*

JOBBING FOUNDRIES HAVE A PROBLEM in handling a variety of short-run patterns. At Beloit Foundry much of this work is effectively handled on a J&J Jolt Rol-A-Draw. Pattern change time is minimized and machine handling of medium and medium-large flasks greatly reduces the load on cranes. The new J&J Rol-A-Draws feature *automatic air clamping of pattern boards. Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill., will provide full data.*

80% OF BELOIT FOUNDRY'S DOUBLED TONNAGE is rammed by this Motive Speedslinger in a bay only 30 feet wide. Before its installation the foundry produced a little over 30 tons daily. After the Speedslinger was placed in operation this daily tonnage was boosted to 60. Not only that, but the foundry gets better results and can handle a wider range of large patterns. The slinger gives the foundry better control and uniformity too. *Write now for full information: Beardsley & Piper, 2424 N. Cicero Ave., Chicago 39, Ill.*

DELTA *fast-dri*

LIQUID RESINS AND BINDERS FOR *FASTER PRODUCTION* OF BETTER CORES *at lower cost!*

Cores made with DELTA 155-X and 168-X FAST-DRI Liquid Resins have 1) — an unusually high tensile strength (20% greater than linseed oil), 2) — a lower gas ratio, 3) — a higher degree of elasticity, 4) — less core embrittlement and 5) — greater surface core hardness.

Core sand mixes made with DELTA FAST-DRI Liquid Resins have excellent flowability resulting in denser cores and better workability in core boxes.

The uniformity of DELTA 155-X and 168-X FAST-DRI Liquid Resins is guaranteed. The chemical and physical constants are maintained by strict laboratory control.

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CORE AND MOLD WASHES:
For all types of sand cast metals: Steel, Gray Iron, Malleable and Non-Ferrous.

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PARTING COMPOUNDS

•

MUDDING AND PATCHING COMPOUNDS

•

NO-VEIN COMPOUND

•

MOLD SURFACE BINDERS – LIQUID

•

PERMI-BOND

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DRI-BOND
(Dry Binder)

•

BONDITE BINDER

•

96•B SAND RELEASE AGENT

•

CORE ROD DIP OIL NO. 224X

•

SAND CONDITIONING OIL

•

CORE OILS

•

DELTA-DIETERT PROCESS BINDER 103XX
For deep process shell cores.

•

DELTA

Working samples for test purposes together with complete data are available to you. Included, also, will be information on other Delta Core Oils, Delta Dri-Bond and Delta Bondite. Your request will receive immediate attention.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SCIENTIFICALLY CONTROLLED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

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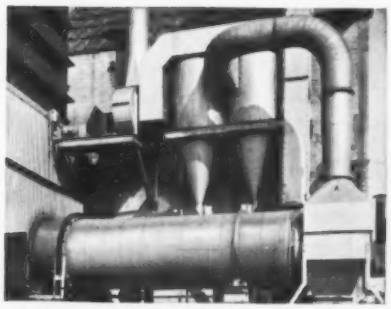
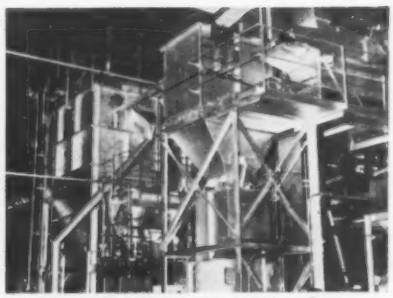
For handling sand and castings--



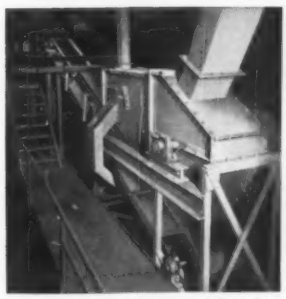
DRYERS — Link-Belt Roto-Louvre uniformly dries and cools large tonnages of sand. Floor space is conserved because no extra cooler is required.

SHAKEOUTS AND SCREENS — Complete line provides centralized separation of sand and castings or sand screening for every type and size foundry.



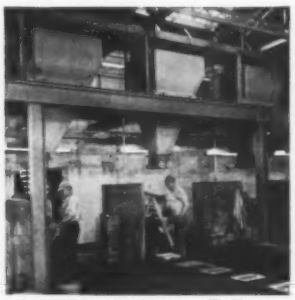
BUCKET ELEVATORS AND BINS — Low-cost elevating and storage of sand. Sturdily built in a wide range of types and sizes.

LINK-BELT quality equipment...



REVIVIFIERS — Thoroughly disintegrate, blend, cool molding sand so it will ram to uniform density. Also remove shot.

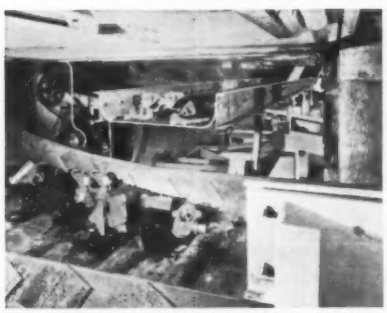
BELT CONVEYORS — Flat belt has plows to distribute sand to molders' hoppers. Troughed type used for other sand handling.



MOLDING HOPPERS — Built to avoid arching and allow free sand discharge with easy-operating duplex discharge gates.

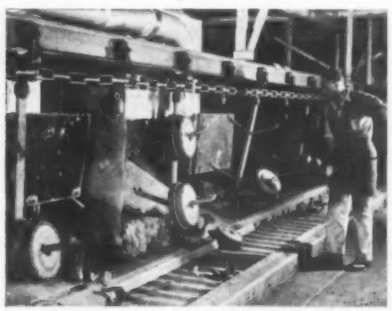
MOLD CONVEYORS — A full line of car, pallet, roller and trolley types meets all variations of foundry practice.

cuts your costs every step of the way



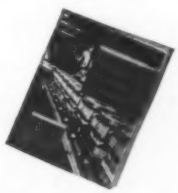
OSCILLATING CONVEYORS — Ideal for hot shakeout sand and castings. One-piece, all-metal trough eliminates wear, leakage. With screened trough section, acts as shakeout.

APRON CONVEYORS — No-leak design for long-life service on hot sand and castings. Operates in horizontal or steeply inclined paths. Also good as sorting conveyor.



OVERHEAD TROLLEY CONVEYORS — Cores, molds and castings are economically handled. Complete flexibility of path and capacity provided plus saving of floor space.

Ask your nearest Link-Belt office for new Book 2423. It shows Link-Belt's complete line of modern equipment for ferrous and non-ferrous foundries plus 7 tested layouts.



LINK-BELT

CONVEYORS AND PREPARATION MACHINERY

MEMBER FEMA

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

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City Pattern Foundry & Machine Company offers unparalleled facilities for the complete production of cast and machined parts. Working directly from your part print, we make the pattern, cast the parts and then precision machine them; all operations are performed right under our own roof.

In every phase of the processing the most modern methods and equipment are used. And to safeguard consistent high quality, every known piece of inspection equipment is on hand to chemically, physically and dimensionally measure your parts before shipment.

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Since 1913...

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VOLCLAY BENTONITE
NEWS LETTER No. 10
REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

Cuts and Washes

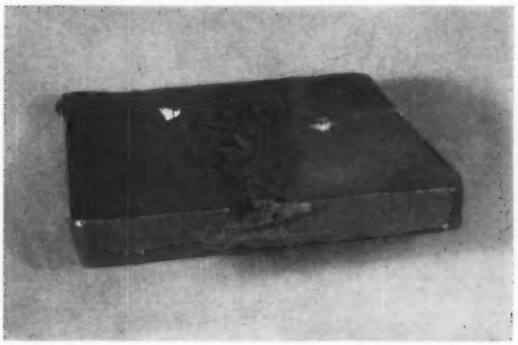


Photo courtesy of Harold L. Ullrich

Cuts and Washes are described by the AFS "Analysis of Casting Defects" as the result of erosion of the sand by metal going over the mold or cored surface. They appear as rough spots and excess metal at the place where defects occur; usually sand inclusions appear at some other part of the casting. They may occur directly in front of the gate or at other sections on the mold where there is a nozzle effect of the metal flow.

Gas erosion defects usually occur in the cope, risers, necks or adjacent to the riser. They are due to the cutting action of hot gases passing through restricted openings at high velocity.

The photo is very descriptive of a casting that has poor gating design. When excessive metal flows over any given portion of a mold surface, such cutting action may result.

A nozzling effect has been created; whereas, a sufficient number of pin or knife in-gates would better distribute the metal into the mold cavity. **Soft ramming of this gate no doubt contributed somewhat to the cutting action** as the molder was afraid to ram too hard over the flat surface for fear of creating a buckle, rat-tail, or cope scab.

This casting was perhaps poured rapidly to assure that the metal filled the mold promptly in order to avoid such expansion defects as stated above. The excess metal entering the mold helped to create the cutting of the softer rammed gates.

Even with poor gate design or other loose molding practices, a satisfactory molding sand mixture can help to eliminate such defects. It is essential that a bonding material be used that assures higher dry, baked, and fired strengths to resist such a defect.

Volclay Western Bentonite furnishes enough hot or retained strength in a sand mixture to resist such cutting action. 5% by weight Volclay Western Bentonite with 3%-3.5% moisture content is usually ample.

Increasing the amount of Volclay Western Bentonite, increasing the moisture content slightly, reducing the carbonaceous materials and possibly adding small additions of a plastic fire clay bond, plus harder ramming at the gate area tends to eliminate such defects where gating and other molding practices tend to encourage cuts and washes.

AMERICAN COLLOID COMPANY

Chicago 54, Illinois • *Producers of Volclay and Panther Creek Bentonite*

For more data, circle No. 542 on postage-free Reader Service card on p. 17 or 18

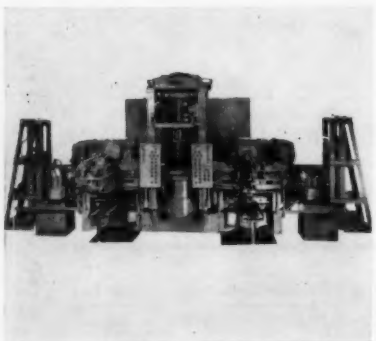
Products & Processes

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

▲ Mobile Shovel

New small, mobile power shovel with a capacity of 11 cf or 1200 lb suitable for handling sand, chemicals and other loosely packed bulk materials in close quarters is now in production. Named Bulk Master, the shovel has an outside turning radius of only 73 in. which makes it especially suitable for working in narrow aisles and tight corners. Other dimensions: length, 109 in.; width, 46½ in.; overall height, 60 in.; weight, 4400 lb. Drive tires in front are pneumatic. *Clark Equipment Co.*

For more data, circle No. 487 on p. 17



▲ Blower and Draw Machine

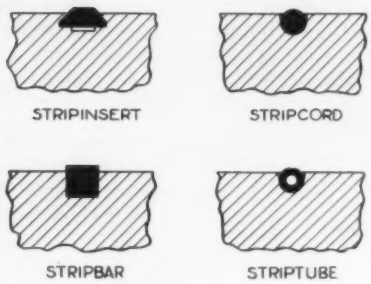
Core blower and draw machine, SP-320, is made of cast iron and of cast steel. Machine sprays core box; car moves under blow head; air cylinder under car moves car assembly up to blow plate; core is blown; car is then lowered down with pin assembly moving over blown core; bottom air cylinder raises car up a second time, squeezing pins into filled core box; car will move out to end of track; assembly will then roll over, with draw table rising up to meet top of core box. *Sutter Products Co.*

For more data, circle No. 488 on p. 17

▼ Core Box Sealers

Three new types of rubber insert material have been announced, for use as core box sealers. New insert styles are: Stripcord, which is a solid strip; Striptube, a thick walled, round tube; and Stripbar, a square, solid strip. Strips have been added to the Martin line to fill the need for special types required in specific applications. Descriptive literature describing Stripinsert, the original, and the three new styles of insert material are available. *Martin Engineering Co.*

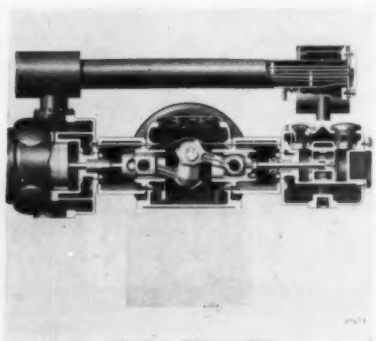
For more data, circle No. 489 on p. 17



▼ Air Compressor

Packaged air compressor in the 75-100 hp range that approaches the good efficiency and economy of larger, more powerful, slow speed compressors has been introduced. Known as the PHE, the machine is an opposed-cylinder, balaced design driven by a direct connected, induction motor. Basic design is a two-stage unit for 80-125 psi but other cylinder arrangements are available for higher pressures or for pumping vacuums. Descriptive literature is available. *Ingersoll-Rand Co.*

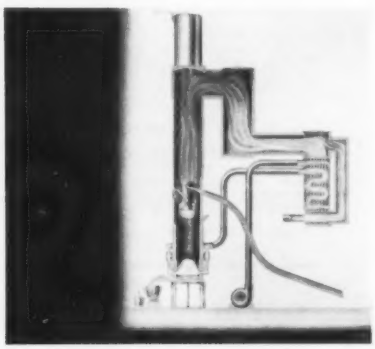
For more data, circle No. 490 on p. 17



▲ Mulling Timer

New, simplified two timer mulling cycle has been announced for use with the Beardsley & Piper Speedmullor. Mulltrol provides accurate control of over-all mulling time and of the discharge time. It insures a high degree of uniformity in mulling foundry sand mixes to required physical properties. Where complete control of all phases of the mulling cycle is required, Mulltrolmatic, is recommended. Where control of the over-all mulling cycle will suffice Mulltrol is recommended. *Beardsley & Piper.*

For more data, circle No. 491 on p. 17

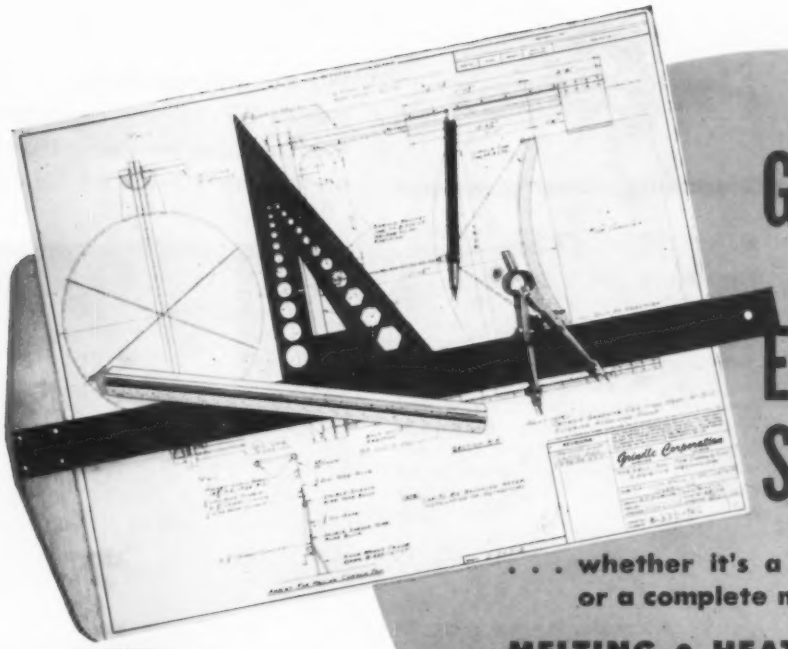


▲ Heat Exchanger

New heat exchanger using thin-wall alloy steel tubes has been developed by Whiting Corp. for use with its single-pass recuperative type hot-blast system. Unit is lighter in weight and requires less floor space than conventional two-pass heat exchanger. Because of its higher efficiency, it increases still further the advantages of hot blast particularly for foundries producing upwards of 100 tons per day and for specialty shops producing "hard to make" castings. *Whiting Corp.*

For more data, circle No. 492 on p. 17

continued on page 12



GRINDLE *Means* Engineered to Specification

. . . whether it's a simple charging system or a complete melting unit

MELTING • HEAT TREATING
STACK GAS PURIFYING
and ACCESSORY EQUIPMENT

for

FERROUS and NON-FERROUS FOUNDRIES

Every *Grindle* installation must meet rigid Company standards of Quality, Performance, Economy . . . in initial cost and operation.

That's why every *Grindle* installation builds customer satisfaction and "good neighbors" for *Grindle* customers.

Grindle installations are self-liquidating.

Grindle Products and Services

Blowers—cupola and combustion air • Burners—oil, gas and pulverized coal • Cars—scale and transfer • Charging equipment • Charge make-up equipment • Conveying systems (pneumatic) • Cupolas • Cupola accessories • Dust, fume and smoke control equipment • Engineering and operating services • Furnaces—reverberatory and rotary melting . . . ferrous and non-ferrous . . . gas, oil, or powdered coal fired • Heat exchangers • Hot blast systems • Hot metal holding furnaces • Igniters for coke and cupola gas • Instruments and control panels (special) . . . Temperature controls . . . Thermocouples . . . Flowmeters—air and gas . . . Pyrometers (special) • Jib cranes • Ladles • Ovens—Heat treating for ductile, steel sections and malleable iron castings • Pulverizers • Rock wool producing equipment • Slag handling and granulating systems • Spark and dust collectors • Turntables.

"THE FINGERPRINT OF DEPENDABILITY AND DEPENDABILITY"
Complete Melting, Heat Treating Stack Gas Purifying And Accessory Equipment

For More Complete Details

GRINDLE *Corporation*

MEMBER FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, INC. FEMA

16237 Turner Avenue
Harvey, Illinois

. . . *and the* names of Grindle District Representatives, Projects and Customers—send for Bulletin No. J-51 . . . free upon request.

Please send copy of Bulletin J-51

Name_____

Firm_____

Street_____

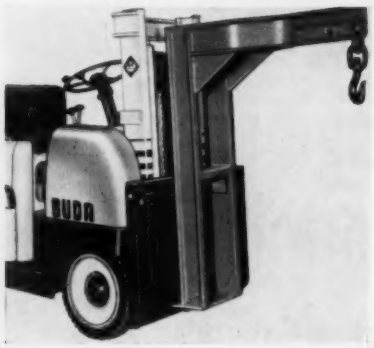
City_____ Zone____ State_____

For more data, circle No. 543 on postage-free Reader Service card on p. 17 or 18

Products & Processes

continued from page 10

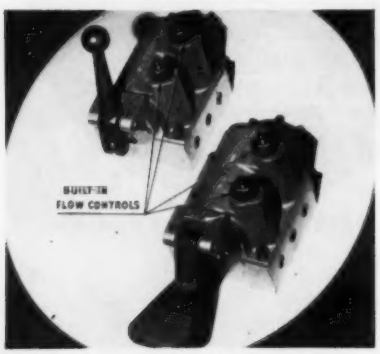
Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20



▲ Crane Arm Attachment

Crane Arm to supplement line of attachments for Buda Fork Lift trucks has been developed. It provides a quick, economical method for handling loads where forks or clamps are not applicable. Buda Crane Arms are available in sizes of 24 in., 36 in., 48 in., 60 in., 72 in., and include such features as: adjustable load center; easy installation; may be used with or without forks; constructed of reinforced channel steel. Special sizes also available. *Buda Co., Div. Allis-Chalmers Mfg. Co.*

For more data, circle No. 493 on p. 17



▲ Four-Way Valve

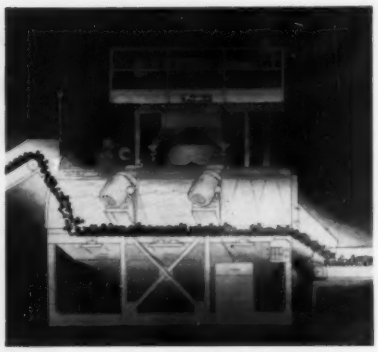
Hand-and-foot operated four-way valve with patented built-in, full-capacity flow-control meters of the Venturi type has been announced. It is an air and low-pressure hydraulic valve, specifically designed for the control of double acting air or hydraulic cylinders. Valve features one balanced spool using renewable "O" ring type of packing. Four standard pipe sizes are available ¼ in., ⅜ in., ½ in., and ¾ in., for air, oil or water. *Airmatic Valve, Inc.*

For more data, circle No. 494 on p. 17

▼ Cleaning Barrels

Five sizes of Type GO Continuous-Flow Rotoblast cleaning barrels ranging from the No. 1, which has a 48 in. diameter drum, to No. 5, with a 72 in. diameter drum, are now available. Units are equipped with abrasive reclaiming systems which thoroughly clean the abrasive for re-use, retaining full blasting efficiency, discarding all fines and other refuse. Barrels are ideally suited for applications such as a foundry planning a maximum amount of automatic operation. *Pangborn Corp.*

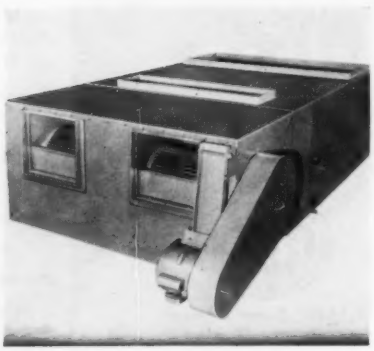
For more data, circle No. 495 on p. 17

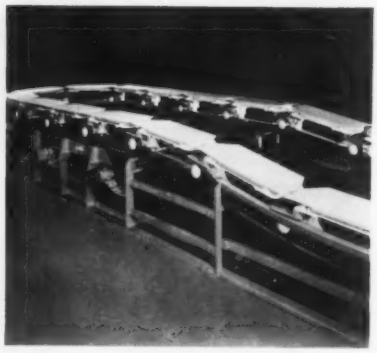


▼ Heating-Ventilating Units

New line of Herman Nelson heating-ventilating units, designed for industrial application has been announced. Units, with capacities ranging from 1200 cfm to 15000 cfm, can provide heating, ventilation, filtering, humidifying, or any combination of these functions. Models are available for installation on floors, ceilings or walls. In addition to wide range of cabinet designs and air volumes, units are available with any of 10 different heating coils. *American Air Filter Co.*

For more data, circle No. 496 on p. 17

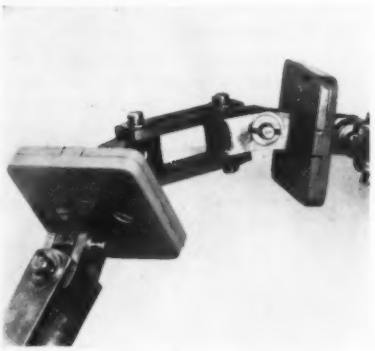




▲ Mold Conveyor

Jeffery Universal Mold Conveyor, capable of smooth mold handling up and down inclined planes as well as on the level, has been announced. Featuring articulated connections between the cars and internal type takeups, conveyor requires no lubrication. It is equipped with permanently lubricated ball bearings and oil impregnated bushings. All moving parts below the car tops are fully protected from sand, shot or runouts by means of specially designed shields. *Jeffrey Manufacturing Co.*

For more data, circle No. 497 on p. 17



▲ Two-Directional Chain

New totally enclosed bulk material handling conveyor featuring a two-directional chain to convey in any direction has been announced. Bulk material is conveyed through square tubular section by means of two-piece spaced metal flights. Two-piece flight can be replaced without disassembly of chain. Flights can be changed at any convenient spot, such as drive box, by indexing conveyor forward as required. Can have any number of feed and discharge points. *Prab Conveyors, Inc.*

For more data, circle No. 498 on p. 17

continued on page 17

"TELL-ALL" panel gives you four advantages

The *Foundromatic* dryer gives you all the advantages of dielectric drying plus the operational convenience and simplicity of "Tell-All" control.

1. Meters, lights, buttons are panel mounted at eye level, enabling operator to keep on top of operation at all times.

2. Electrode control permits adjusting to the physical variances of cores.

3. Electrical overloading is prevented by the belt-loading control. Conveyor stops when load is too great.

4. Automatic grid control assures correct drive to oscillator tube regardless of oven load.

Advantages of Dielectric Drying Over Oven Drying

Drying time measured in minutes — smoother core finishes — superior shakeout characteristics — clean, cool core rooms — elimination of core storage — 60% fuel savings — all these advantages are yours with dielectric drying.

Compare features and operating records of the various dielectric dryers available. You will discover, because it is easier to operate, the *Foundromatic* dryer augments and multiplies the inherent advantages of the dielectric method.

Six minutes is all it takes to dry this core in a *Foundromatic* dryer. The job would take 70 minutes in a conventional oven.

Get all the facts on dielectric core drying — call your nearby Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 15B7306B.

A-4450

Foundromatic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

For more data, circle No. 544 on postage-free Reader Service card on p. 17 or 18

SITUATION UNDER CONTROL — BY KEOKUK

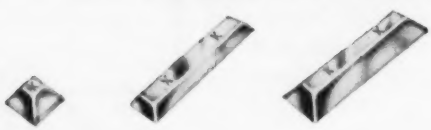
KEOKUK
CHIEF KEOKUK:
"Little Chief say old way get smoke signals crossed. He cut letters in blankets!"
PRINCESS WENATCHEE:
"As usual he has the situation well under control!"
dickstone

KEOKUK ELECTRO-METAL COMPANY

KEOKUK, IOWA

WENATCHEE DIVISION, WENATCHEE, WASHINGTON

Smoke out high costs and control quality with Keokuk Silvery Pig Iron! Keokuk assures less waste and exact control of the melt through uniform silicon distribution. Car for car, pig for pig, its uniformity *never* varies. Charge Keokuk by magnet or count.



Keokuk Silvery . . . the superior form of silicon introduction for steel plants and foundries . . . available in 60 and 30 lb. pigs and 12½ lb. piglets . . . in regular or alloy analysis. Keokuk also manufactures high silicon metal.

SALES AGENT: MILLER AND COMPANY

332 S. Michigan Ave., Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio
8230 Forsyth Blvd., St. Louis 24, Missouri

For more data, circle No. 545 on postage-free Reader Service card on p. 17 or 18

Cupoline for your Cupolas...

Cupoline Bondact Mix is proportioned for use in the Bondact machine. This combination makes contour patching simple, ends uncertainties of hand mixes, avoids joints and weak points. Moisture is easily controlled.

PUT CUPOLINE TO WORK WITH THE BONDACT MACHINE

Cupola patching with the BONDACT machine using Cupoline refractory is a continuous story of substantial savings. Smaller cupolas can be patched in as little as 10 minutes and the average cupola in less than 30 minutes.

Save yourself many cupola headaches. Get actual case histories of money-making conversion to the Bondact air placement method of patching cupolas. . . Better service than ever from three shipping points.

International Minerals & Chemicals

EASTERN CLAY PRODUCTS DEPT.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

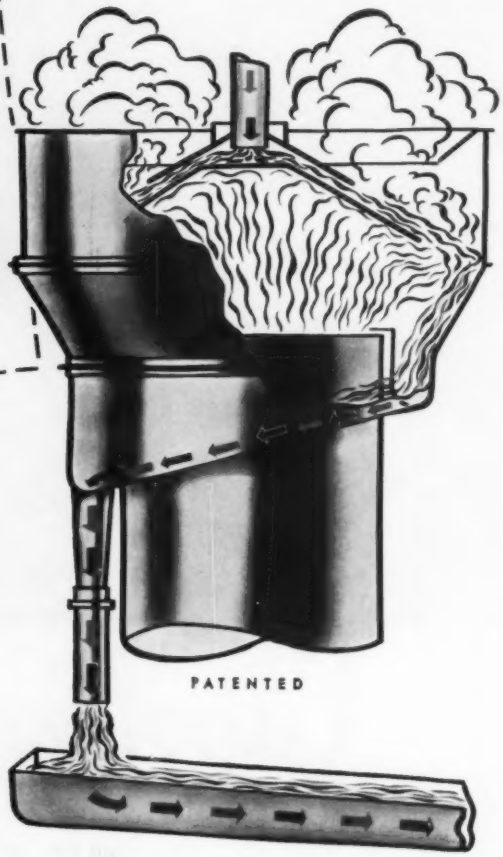
General Offices: 20 North Wacker Drive, Chicago, 6

DIXIE BOND • BLACK HILLS BENTONITE • TRIPLACT • REVIVO CORE PASTE • REVIVO BOND • BONDACTOR • CUPOLINE • BURA PRODUCTS • WESTONITE

For more data, circle No. 546 on postage-free Reader Service card on p. 17 or 18

Years ahead in features that favor your budget-

"SW" CUPOLA COLLECTORS



Budget conscious foundry management has singled out Schneible for dollars and cents value in cupola fly-ash control equipment. Wherever you are, note the cupolas that are capped with "SW" Cupola Collectors. Large and small producers alike agree they do the job *better for the least.*

Schneible patented "SW" Collectors have eliminated endless man-hours of clean-up work to protect expensive facilities from deterioration and more than paid their installation in savings on plant maintenance costs.

Better employee and public relations and more over-all productivity are added benefits enjoyed by foundries equipped with these efficient Cupola Collectors.

Latest Bulletin 554 covers in detail many more *plus* features, arrangement and helpful test data. Request your copy today without obligation. We will arrange a tour of Schneible equipped foundries in your area for interested prospective buyers.

★ SIMPLICITY
★ ACCEPTABILITY*
★ FLEXIBILITY
★ EFFICIENCY
★ DEPENDABILITY
★ LONGEVITY

*Meets all Industrial Pollution Codes (except one).

CLAUDE B. SCHNEIBLE COMPANY
P. O. Box 81, North End Station • Detroit 2, Michigan

Cable Address: CBSCO
European Licensee: Elex S. A., Zurich, Switzerland

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

Write for Bulletin 554 without obligation

SCHNEIBLE

For more data, circle No. 547 on postage-free Reader Service card on p. 17 or 18

Products & Processes

continued from page 12

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

Platform Truck

Specially designed low-lift platform truck has been engineered to handle a unique, extra-long rack which serves as a storage unit, load carrier, and work positioner. Truck has a 108 in. long platform, a capacity of 10,000 lb, and is gasoline-powered. *Elwell-Parker Electric Co.*

For more data, circle No. 499 on card

Cold Galvanizing

New approach for protecting iron and steel surfaces from corrosion has been announced. Known as Galvicon, it combines with the base metal and actually galvanizes it. Can be applied by either the brush or spray method, eliminating the necessity of dismantling or interrupting operations. *Galvicon Corp.*

For more data, circle No. 505 on card

Cleaning Machines

New models of Turbo-Blast Parts Cleaning Machines, which combine three basic factors in cleaning science—physical force, chemical detergency and heat—have been announced. Models range in sizes from 20-gallon solution capacity to 2,300-gallon. *Storm-Vulcan, Inc.*

For more data, circle No. 500 on card

Plastic Laminated Patterns

Plastic laminated foundry patterns are produced by an inexpensive method of pattern duplication, utilizing the latest in non-shrink plastics combined with fibre glass cloth. Tensile strength is rated from 40,000 to 50,000 lb psi. *Plastic Tool Co. of America.*

For more data, circle No. 506 on card

Penetrant Inspection

New scale of sensitivity in penetrant inspection is available, it is claimed, in new fluorescent penetrant inspection materials, Zyglo-Pentrex. Its greatest advantage, it is pointed out, is in finding both very tight cracks and broad, shallow defects. *Magnaflux Corp.*

For more data, circle No. 501 on card

Metal Finishing

New engineering developments made possible by Roto-Finish experimental facilities, have extended the original barrel finishing process to include entirely new special fixtures, machinery and equipment. *Roto-Finish.*

For more data, circle No. 502 on card

Two-Screw Conveyor

Development of a portable two-screw granular product conveyor unit capable of handling up to 60 tons of material an hour, has been announced. Unit's hydraulically-controlled elevating screw is adjustable to heights ranging from six to sixteen feet. *Delta Tank Manufacturing Co.*

For more data, circle No. 503 on card

Cable Electric Hoist

Cable Quik-Lift Electric Hoists are now available. Units range in capacity from 500 to 4000 lb with a choice of lifting speeds and types of suspension. Further details are available in Bulletin C Q. Prices and specifications are also available. *Coffin Hoist Co.*

For more data, circle No. 504 on card

More data, information, prices can be obtained in all advertised and listed products, bulletins, services by using postage-free Reader Service card

Reader Service Dept. 54|10

Please have manufacturer send me without obligation information or bulletins indicated by numbers circled.

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PRODUCTS & PROCESSES				487	488	489	490
491	492	493	494	495	496	497	498
499	500	501	502	503	504	505	506
FREE INFORMATION				507	508	509	510
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527	528	529	530	531	532	533	534
ADVERTISED PRODUCTS & SERVICES						535	536
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TITLE

COMPANY

ADDRESS

CITY AND ZONE

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First Class Permit No. 14680, Sec. 34.9 P. L. & R. CHICAGO, ILL.

Reader Service Dept.

AMERICAN FOUNDRYMAN

Golf & Wolf Roads

Des Plaines, Illinois

Free Foundry Information

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

Tractor Loader

Form No. AD-78 is a condensed picture catalog on the new Model 20 Shovel-Loader, a rubber-tired tractor loader with a standard bucket capacity of 12 cf. Designed for handling of bulk chemicals, sand, dry materials, casting, scrap, etc. *Baker-Lull Corp.*

For more data, circle No. 507 on card

Dustless Seacoal

Bulletin F-125 describes Stevens "Kleen-Air" Dustless Products. Advantages claimed for Dustless Seacoal and Pitch are: costs are cut; cleaner air and better working conditions are provided, and they do not loose their dustless characteristics on long exposure to the air. *Frederick B. Stevens, Inc.*

For more data, circle No. 509 on card

Performance Work Kit

A method for predetermining the times necessary for Fork Lift Trucks to perform specific operations has been provided in a Work Kit which will enable plants to apply fork lift truck standard performance data. Kits are available without cost. *Yale & Towne Mfg Co.*

For more data, circle No. 511 on card

Two-Station Machine

Catalog No. JSI-2-54 describes the Herman Stationmaster, a new two-station indexing type jolt, squeeze, strip machine. Unit can be controlled automatically, semi-automatically or manually. Specifications and diagrams are included. *Herman Pneumatic Machine Co.*

For more data, circle No. 508 on card

Shell Molding Machine

Bulletin 154 illustrates and describes the Pneudraulic Model 12 x 18 semi-automatic Shell Molding Machine. Features claimed are: low first cost; utilizes unskilled labor; eliminates human element, versatile, and rapid, low cost production. *Centrifugal Casting Machine Co.*

For more data, circle No. 510 on card

Flame Photometry

Beckman Reprint R-56, Flame Photometry—New Precision in Elemental Analysis, by Paul T. Gilbert, Jr., reprinted from Industrial Laboratories, is now available. Lists typical industrial applications, gives the problem, solution and the results. *Beckman Instruments.*

For more data, circle No. 512 on card

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AMERICAN FOUNDRYMAN

Golf & Wolf Roads

Des Plaines, Illinois

Rubber Catalog

Catalog 25-C covers V-belts, transmission belts, conveyor belts, all types of hose, molded products and outlines such new products as the Poly-V Drive, R/M Super-Power V-Belts, and the Hydro-Lok Rubber Pipe Flange. *Raybestos-Manhattan, Inc.*

For more data, circle No. 513 on card

Cupola Collector

Bulletin-554 lists many of the features of the "SW" Cupola Collector. Photos illustrate actual installations and folder also contains a diagram of the unit. The installation and auxiliary equipment are also described. Test chart is also shown. *Claude B. Schneible Co.*

For more data, circle No. 514 on card

Refractory Material

Brochure, Corhart 104 Electrocast Refractory, describes the new refractory material, Corhart 104, and its application to the open hearth steel furnace. Lists laboratory tests and field test results. Also interprets laboratory results. *Corhart Refractories Co., Inc.*

For more data, circle No. 515 on card

Ductile Cast Iron

Bulletin DI-2 presents data on machinability, gall resistance, compressive strength and other mechanical properties of this recently developed family of irons. Examples are given illustrating the appropriate use. *International Nickel Co.*

For more data, circle No. 516 on card

continued on page 20

Reader Service Dept. 54|10

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FREE INFORMATION				507	508	509	510
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TITLE

COMPANY

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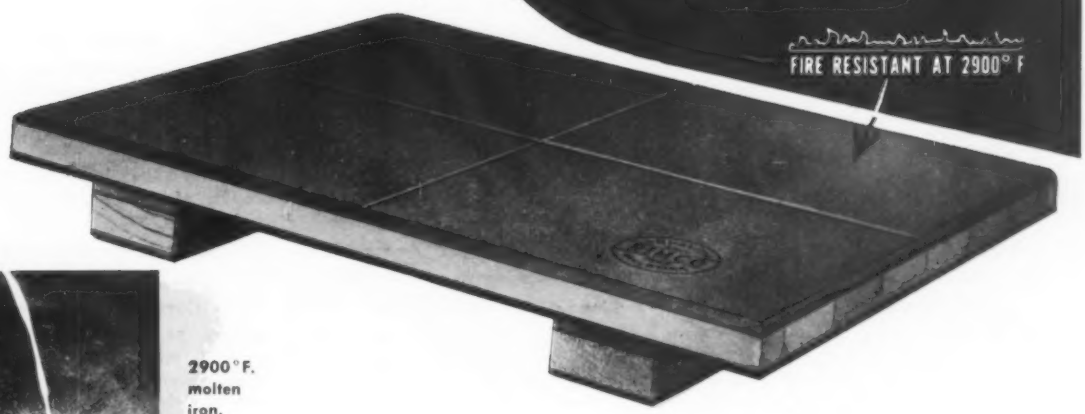
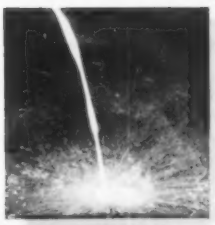
CITY AND ZONE

THE new RIMCO squeeze BOTTOM and pattern BOARD

FIRE RESISTANT AT 2900° F





2900°F. molten iron.

Hot metal after three minutes.

Surface scarred but undamaged.

LASTS MORE THAN TEN TIMES LONGER

Warp-Free *Smooth Surface* *No Deflection*
Fire-Resistant *No Burn-outs* *Use Both Sides*
Lower Cost Per Mold *All Sizes*

RIMCO Squeeze, Bottom and Pattern Boards are surfaced on both sides with specially-processed RESINWOOD — the outstanding industrial hardboard. Designed to withstand intense heat and pressure, RESINWOOD'S superior construction is now available to the foundry in these high-density durable Bottom Boards. Over 85 years of experience support the development of tested and proven RIMCO Bottom Boards.

FREE SAMPLE...

Send today for a free sample of this amazing RESINWOOD facing. Test it in your own foundry. See how the processed RESINWOOD stands up under 2900°F. molten metal. You can be sure of lower production costs with the RIMCO BOTTOM BOARD.

NOTE: Foundry readers state that RIMCO is "the best squeeze board on the market."

QUALITY Since RIMCO 1868 MILLWORK

ROCK ISLAND MILLWORK COMPANY

RESINWOOD DIVISION

Rock Island Illinois

Ask The Federal Foundry Supply Co. representative. Cleveland—Crown Hill, W. Va.—Chicago—Detroit—Milwaukee—Richmond, Va.—St. Louis—Chattanooga—New York—Upton, Wyo.

For more data, circle No. 548 on postage-free Reader Service card on p. 17 or 18

Free Foundry Information

continued from page 18

Fill out postcards on pages 17-18 for complete information on items listed on pages 10-12-17-18-20

Burners and Equipment

Bulletins No. 721 and 1087 show typical applications of both stationary and portable type oil and gas burning equipment for ladle heating and drying. Specifications and diagrams of the various units are also included. *Hauck Manufacturing Co.*

For more data, circle No. 517 on p. 18

Thermocouple Wire

Bulletin Form No. 1200 illustrates and describes the complete line of Serv-Rite thermocouple wire and thermocouple extension wire. Listed are various sizes, metals, insulations and prices. General application data for various type wires are included. *Claud S. Gordon Co.*

For more data, circle No. 523 on p. 18

Unbonded Sands

Bulletin No. 102 discusses Whitehead eastern unbonded sands. Comprising Dividing Creek Washed and Classified sand, New Jersey Washed and Screened Silica Sand, Dorchester Grain, Cedarville Sharp Sand, Jersey Fire Sand, New Jersey Unwashed Sand, and others. *Whitehead Brothers Co.*

For more data, circle No. 529 on p. 18

Epoxy Resin

Three Technical Bulletins, Nos. 1, 2 and 3, on Bakelite C-8 epoxy resins have been issued in a 6-page folder. Specific data are given on the physical properties of individual resins and hardners, together with the physical, chemical and electrical properties. *Bakelite Co.*

For more data, circle No. 518 on p. 18

Kiln Type Ovens

Bulletin No. 554 describes a versatile line of Standard Kiln Type Ovens for baking, heating, drying and curing. It provides complete information of special features, performance and available sizes. Engineering features are included. *Michigan Oven Co.*

For more data, circle No. 524 on p. 18

Radiography

Brochure, now available, is offered as a brief outline of the scope of non-destructive, radiographic testing to those firms not yet familiar with its advantages as well as a "capsul" review for veteran users who have discovered the multiple benefits of radiographic testing. *Industrial X-Ray, Inc.*

For more data, circle No. 530 on p. 18

Dust Collector

Booklet, by use of photos, diagrams and charts, points out the advantages of the Hersey Mikro-Collector for product recovery, effective industrial dust control and pneumatic material conveying Approximate filter rates of typical materials are included. *Pulverising Machinery Co.*

For more data, circle No. 519 on p. 18

Dispersions for Industry

Bulletin No. 460 points out how 'dag' colloidal dispersions serve industry in a wide range of uses. Centerfold table lists 40 basic dispersions of graphite, molybdenum disulfide, vermiculite, and zinc oxide, in carriers such as water and oil. *Acheson Colloids Co.*

For more data, circle No. 525 on p. 18

Core and Mold Ovens

Bulletin 54, profusely illustrated with actual installations in prominent foundries, describes the advantages of each type of Coleman Core and Mold Ovens. Many special purpose designs are shown in addition to the standard line of Coleman Ovens. *Foundry Equipment Co.*

For more data, circle No. 531 on p. 18

Melting Furnaces

Bulletin 102 describes the single burner stationary crucible furnace for brass, bronze and aluminum; for gas or oil fuel. Chart shows style, crucible size and capacity in lb. Photos and diagrams are also included in the brochure. *Campbell-Hausfeld Co.*

For more data, circle No. 520 on p. 18

Betatron Laboratory

Bulletin 31B8121 discusses factors to be taken into consideration in planning and constructing a betatron industrial radiography laboratory. Also weighs the advisability of altering existing radiography facilities for betatron use. *Allis-Chalmers Mfg. Co.*

For more data, circle No. 526 on p. 18

Standard Products Catalog

Catalog 950, 340-page book listing standard products, has just been published by Link-Belt Co. Contains clear and concise capacity charts and dimension tables which aid in rapid selection of standard products and stock items for new installations. *Link-Belt Co.*

For more data, circle No. 532 on p. 18

Foundry Modernization

Illustrated booklet, "How to Modernize Your Foundry," presents five typical case-problems and solutions with actual savings realized. Explains how judicious spending to keep plants modern can increase quality, production and profits. *Lester B. Knight & Associates.*

For more data, circle No. 521 on p. 18

Productive Maintenance

Bulletin GEA-6087, "Five Steps to Productive Maintenance," provides detailed information organizing to meet the demands that automation will make on electrical maintenance program. Gathering equipment data is one of the steps discussed. *General Electric Co.*

For more data, circle No. 527 on p. 18

Fire Clay Products

Pamphlet now available describes Goose Lake ground and screened fire clay, fire clay flour, Grundite bond clay, fire clay brick, Firox cupola mix and Carbon Chem-Brix. Photos show actual uses as well as plant operation and facilities. *Illinois Clay Products Co.*

For more data, circle No. 533 on p. 18

Industrial Ovens

Bulletin D-53-20 describes engineering, manufacturing and installation for all processing ovens. Application to industry, source of heat, selection of heater, control of heat, and distribution of heat are covered. *Newcomb-Detroit Co.*

For more data, circle No. 522 on p. 18

Rotary Filing

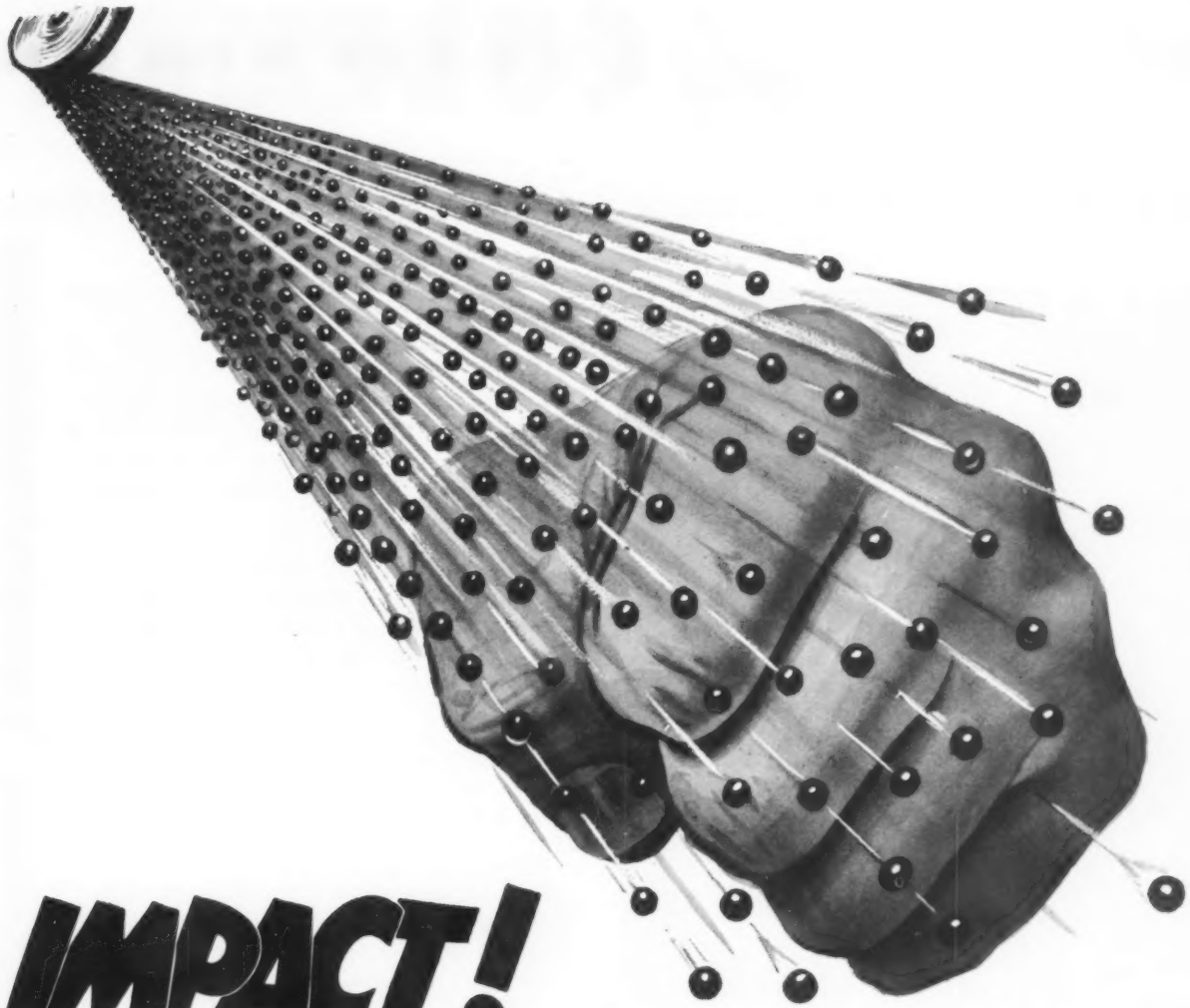
Rota-Files, cutting tools, applicable in almost all fields of manufacturing of metal is fully covered in new bulletin now available. It is pointed out that rotary or power filing in replacing out moded methods lowers costs and increases production. *Rota-File Corp.*

For more data, circle No. 528 on p. 18

Hardsurfacing Alloy

Booklet F-1 deals with the use of Coast Metals Hardsurfacing and Wear Resistant Castings for maintenance and repair of foundry equipment. Lists composition, coating, base metals, characteristics of deposits, welding requirements and special advantages. *Coast Metals, Inc.*

For more data, circle No. 534 on p. 18



IMPACT!

MALLEABRASIVE . . . SHOT OR GRIT . . . is *packed* with blast cleaning power for profitable operation.

Because Malleabrasive is scientifically heat-treated and laboratory-controlled it does a *better, faster* cleaning job. And because it cleans quicker, lasts longer, saves you parts repairs and downtime—Malleabrasive means *cheaper cleaning.*

Words won't prove it—the final test is in *your* equipment. Try Malleabrasive on your jobs and see for yourself. Next time you order blast cleaning abrasive, specify Malleabrasive from PANGBORN CORP., 1300 Pangborn Blvd., Hagerstown, Md.

Pangborn DISTRIBUTORS FOR

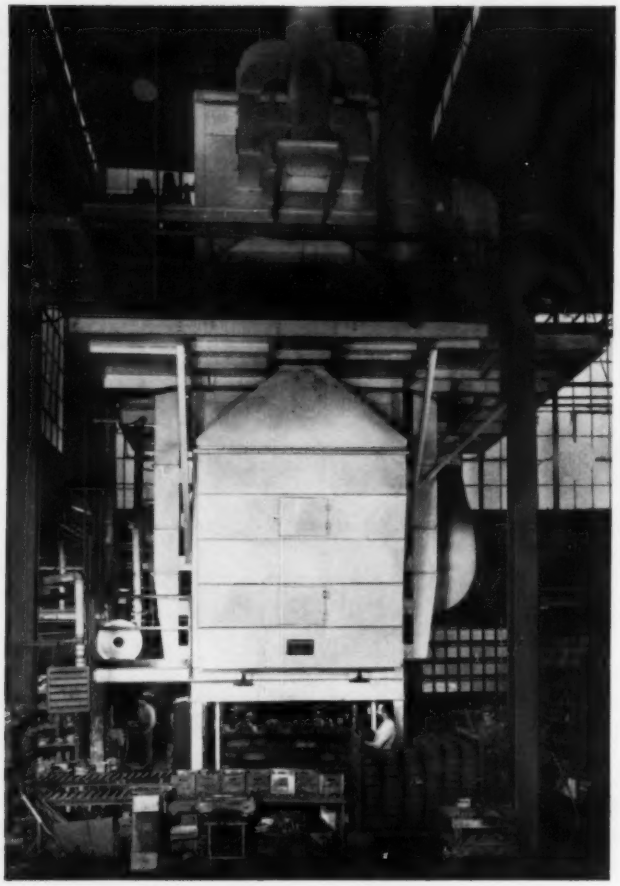
MALLEABRASIVE®

PANGBORN'S 50th ANNIVERSARY—1904-1954

*U. S. Patent #2184926 (other patents pending)

only COLEMAN

are made in a *Complete Range of Types* for the



Coleman Tower® Oven

Are you aware of your core-room costs? Today, more than ever, fast dependable production of uniformly good cores and molds at the lowest over-all cost is vital to profitable foundry operation.

Even with the best of core boxes, machines, binder practice, and labor, your cores will be right only if they are properly baked. Avoid costly make-overs and rejects . . . do your core baking jobs faster and better with Coleman Core Ovens.

Coleman Mold Ovens insure proper drying to make castings true-to-pattern whether molds are to be skin dried or bone dried.

Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work. Profit by this experience — get the unbiased facts on how modern Coleman Core and Mold ovens can substantially reduce your operating costs.

Let us recommend the RIGHT type of core or mold oven for your requirements—we make them ALL!

Write for Bulletin 54

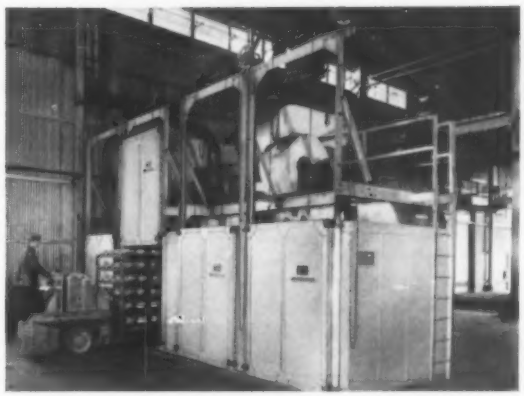
Coleman Tower Ovens	Coleman Portable Ovens	Coleman Continuous Redry Ovens
Coleman Dielectric Core Ovens	Coleman Heat Treat Ovens	Coleman Transrack Ovens
Coleman Car Type Core Ovens	Coleman Portable Mold Dryers	Coleman Horizontal Conveyor Ovens
Coleman Car Type Mold Ovens	Coleman Continuous Mold Ovens	Coleman Rolling Drawer Ovens

For more data, circle No. 550 on postage-free Reader Service card on p. 17 or 18

OVENS

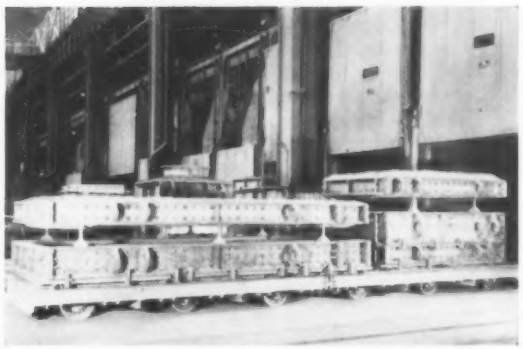
most economical production of cores and molds

Coleman Rolling Drawer Core Ovens



Coleman Transrack Core Ovens

Coleman Dielectric Core Oven



Coleman Car Type Mold Ovens

Only COLEMAN offers a complete line of foundry ovens with all these advantages

RECIRCULATING HEATING OR DIELECTRIC SYSTEMS to meet your requirement best.

DEPENDABLE BAKING AND DRYING. Coleman Ovens remove all uncertainties in core baking and mold drying. Rejects and make-overs are eliminated.

INCREASED LABOR SAVING. Efficient and modern mechanical designs reduce handling and other indirect labor to a minimum.

HEAVY DUTY CONSTRUCTION. Responsible for dependable performance, economical operation, and minimum maintenance cost under rugged service requirements.

MAXIMUM FUEL ECONOMY. Coleman Heating Systems use the most economical fuel available to you — gas, oil, stoker-coal, electricity, etc.

FLEXIBILITY AND ACCURATE CONTROL to bake oil or resin binders—whichever is most satisfactory for your requirements.

BETTER WORKING CONDITIONS. Positive ventilation built into Coleman Ovens prevents leakage of fumes and gases—helps to make the core department a good place to work.

ADVANCED OVEN "KNOW-HOW". Coleman Engineers have pioneered and developed the most efficient oven designs to meet the highly specialized needs of modern foundry methods in all classes of work.

WIDEST EXPERIENCE. Gained through 50 years of specialization in foundry ovens and the building of more than 11,000 successful Coleman Oven installations.

THE FOUNDRY EQUIPMENT COMPANY

1825 Columbus Road • Cleveland 13, Ohio

WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS

For more data, circle No. 550 on postage-free Reader Service card on p. 17 or 18

WEDRON
WASHED • DRIED • GRADED
FOUNDRY SAND
gives you

FINE, ROUNDED GRAIN

From Wedron you get the finest rounded grain sands available. This excellent characteristic greatly reduces cutting out of core boxes, affording considerable savings in foundry operations.

UNIFORM QUALITY

Wedron sands are always uniform. You get what you order. No deviation from shipment to shipment. You can depend on Wedron sands to help you maintain casting uniformity.

COMPLETE RANGE OF SCREEN SIZES

What sand do you need? Whether you use the finest silica flour, fine grades for shell molding or coarser sands for standard casting methods, you can get the best results with Wedron.

GET YOUR NEXT SAND SHIPMENT FROM . . .

MINES AND MILLS IN THE OTTAWA-WEDRON DISTRICT
WEDRON SILICA COMPANY
135 South LaSalle Street, Chicago 3, Illinois

For more data, circle No. 551, p. 17-18

Letters to the Editor

Letters should be addressed to *American Foundryman*, Golf & Wolf Roads, Des Plaines, Ill. Letters must be signed but will be published without signature on request.

When It's Cast, It's gray!

Every time I pick up a trade publication and run into *gray* spelled with an *e* as being a description of iron, I grit my teeth and get irritated.

Seems to me it would be good for the Gray Iron Founders' Society and for the foundry publications to come out with a statement on the proper spelling of *gray* as it relates to iron. Foundries that don't use the American spelling of *gray* with an *a* and others who advertise or use the word with an *e* should be told about it.

In *Iron Age* of July 29, 1954, page F-15, the Frederick Gumm Chemical Co., Kearny, N. J., spells *gray* with an *e* throughout.

PETER E. RENTSCHLER,
President
Hamilton Foundry &
Machine Co.
Hamilton, Ohio

Policy of AMERICAN FOUNDRYMAN *is to spell* GRAY IRON *with an* A.

First Check the Moisture

In our attempts to determine the cause of a given casting defect, we seem prone to do it the hard way, especially where sand failure is evident. With technical terms and a complex phraseology, we seemingly strive to avoid the simple and most logical explanation with a mysterious involvement.

The most important single factor affecting the behavior of foundry sand is water, whether that sand be used in core, mold, or as cupola bottom. This is not debatable. All foundrymen have known it since the very beginning of the casting industry.

Until quite recently, moisture control was merely a matter of guess work. The good foundryman was a good guesser, or he wasn't a good foundryman. Today we have means of determining moisture, and of controlling it to a considerable extent. While it is true that these devices are often far from adequate, they are nevertheless vastly superior to even the best of guess-work. It may seem trite to mention this, but it might be well for all of us from time to time to resort to such elementary reasoning when approaching our sand problems.

If we could guarantee optimum moisture in our sand at the point where it enters the molding flask (for green-sand work), our casting loss would be substantially reduced. This admittedly is difficult to achieve. Even though we are reasonably successful in obtaining desired moisture as the sand leaves the muller, our next problem is to make due allowance for all conditions which promote evaporation. Of such conditions, hot sand leads the list, followed by atmospheric changes, time lag between muller and molder, and the degree of aeration involved. However difficult, it still remains our number one problem.

Most, if not all properties of foundry sand, are affected by water. Additives such as bentonite, seacoal, wood flour, pitch, etc., have their individual and combined functions to perform (and we certainly require greater knowledge of their use), but all are definitely activated by water. Before blaming any of these additives, or the sand itself, for a casting defect, let us first check against moisture.

Scabs, blows, rat-tails, buckles, pinholes, hot-tears, cracks, erosion, hard spots, misruns, swells, and even shrinks are blamed upon many things, but high moisture usually is the real offender. A sand that is deficient in moisture is likely to be brittle and difficult to lift. It will have a tendency to cut or wash, and thus produce sand inclusions. Molders will frequently complain that sand is too dry (it is easier to mold when wet) yet they seldom lose castings due to so-called dry sand.

In our most modern casting methods such as pressure-molding, shell molding, and blowing, extremely low moisture is mandatory. Excellent cores are being produced where no water whatever is added to the sand. Even a dry-sand mold, which many of us consider fool-proof, can buckle badly because of one per cent excess moisture, even though oven temperature and drying cycle are held to a given standard.

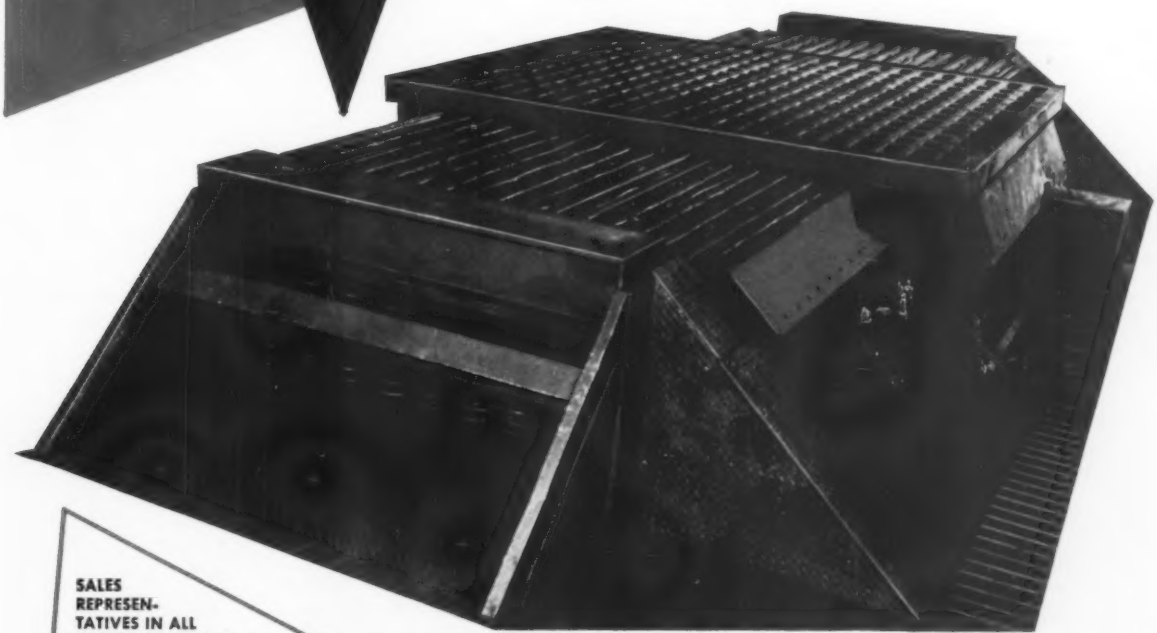
Harry Dietert (Harry W. Dietert Co., Detroit) once stated: "Three-tenths of a per cent variation in moisture could spell the difference between a good and a bad casting." He was wiser than he knew! High moisture can promote mold-wall deformation which frequently develops a definite casting shrink. It increases mold gas and decreases permeability, its means of escape. When confined beyond a certain point, it explodes with sufficient force to send your casting to the scrap heap.

I would not for an instant deprecate the many and varied approaches to sand study, nor the conclusions and recommendations emanating from such research, but I would insist most emphatically that until we control moisture, all other knowledge of sand is useless.

HAROLD E. HENDERSON,
Sand Tech.
H. C. Macaulay Foundry Co.
Berkeley, Calif.

Simplicity spring mounted shake-outs handle big flasks with ease at Beloit Foundry Company in Wisconsin

Installed at the Beloit Foundry Company, Beloit, Wisconsin, this Simplicity Shake-Out arrangement can handle big flasks ranging up to 75 tons regardless of the length or shape of the castings being shaken out. The center of the installation is a Simplicity 10′ x 12′ spring mounted shake-out which is one of the biggest single units in operation today. Prior to the installation of this shake-out, a Simplicity 8′ x 10′ Dual was used. By splitting the Dual and installing the new model between them, Beloit Foundry was able to get 200 sq. feet of useable shake-out surface. A combination of Positive Vertical Action with controlled throw, rugged body construction, and a massive 6′ Ductile Iron (nodular iron) deck which was cast by the Beloit Foundry Company, makes shake-out speedy and thorough without the danger of castings feeding off or bouncing off the deck. For handling heavy concentrated loads ranging up to 200 tons maximum, the Simplicity Spring Mounted Shake-Out is unequaled. If you're pouring really big castings it will pay you to call in your Simplicity sales engineer and let him give you all the facts on Simplicity Shake-Outs and other foundry equipment.



SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario. **FOR EXPORT:** Brown and Sites, 50 Church Street, N. Y. 7, N. Y.

152

Simplicity
TRADE MARK REGISTERED
ENGINEERING COMPANY • DURAND, MICHIGAN

Foundrymen in the News

Hiram Brown, company chief metallurgist, Solar Aircraft Co., Des Moines, Ia., has been chosen to present the 1955 International Exchange Paper to the Institute of British Foundrymen at the International Foundry Congress to be held in London, Eng., in June 1955. His paper will be concerned with an evaluation of casting methods covering both ferrous and non-ferrous fields.

Thomas O. Carson, manager of Rockwell Mfg. Co's. International Div. at New York City, has been promoted to assistant production manager, Nordstrom Valves. **Howard J. Evans,** former chief engineer of the Pittsburgh Equitable Meter Div., has been promoted to chief engineer and manager of the Central Gas Products Research and Development Department. **H. A. Altorfer,** former chief engineer of the Nordstrom Valve Div., has been named chief engineer and manager of the Central Valve Research and Development Dept.

James Rush, formerly of Massillon, Ohio, has joined the sales force of Electro Refractories & Abrasives Corp., Buffalo, N. Y. He will be grinding wheel representative in the Indianapolis territory.

I. Wendell Hamm has been appointed director of manufacturing for the Carborundum Co., Niagara Falls, N. Y. He was formerly chief of industrial engineering for DuPont's Nylon Div., Seaford, Del.

George Lambert has been appointed secretary of the Institute of British Foundrymen to succeed the late T. Makemson. He was formerly assistant secretary and in that capacity was responsible for the production of the Institute's Proceedings and for the work of the Technical Council and its subcommittees.

Elmer R. Kaiser has been appointed director of research for the American Society of Heating and Ventilating Engineers, with headquarters at the Ashve Research Laboratory, Cleveland.

Alfred Sugar has been appointed vice-president and technical director of Alloys & Chemicals Mfg. Co., Cleveland. He was formerly aluminum division plant manager of the American Metal Co., Ltd.

Kermit S. Matz has joined the Emmausus Foundry and machine Co., Inc. as foundry engineer.

John Zytell, formerly chief draftsman at Frederic B. Stevens, Inc., has been promoted to engineer of the company's Metal Finishing Waste Disposal Dept. Duties will include engineering waste disposal installations, equipment and layouts; ordering and expediting delivery of component parts; and maintaining liaison with Stevens customers.

Jeffery Manufacturing Co., Columbus, Ohio has announced the following changes: **Walter J. Hulsey,** district manager, Conveyor Div., and **J. Thomas Berg,** sales engineer, Birmingham, Ala.; **Howard S. Davies,** district manager, Conveyor Div., Pittsburgh, Pa.; **James B. Green,** district manager, Conveyor Div., Chicago; **E. E. Balduff,** sales engineer, Orlando, Fla.; **Travers W. Nelson,** manager, Jacksonville, Fla.; **William A. Cheney,** sales engineer, New York City; **Vernon L. Ekblad,** sales engineer, Houston Texas; **Robert F. Farrell,** sales engineer, Columbus, Ohio; **Robert D. Henning,** sales engineer, Products Engineering Sales Div., Columbus, Ohio; **Robert M. Dunn,** sales engineer, Knoxville, Tenn.; **George S. Kepley,** Coal Preparation Engineering Sales, Pittsburgh, Pa.; and **Edward G. Braun,** Coal Preparation Engineering Sales, Buffalo, N. Y.

The Board of Directors of Magnaflux Corp., Chicago, has announced the following advancements within the corporation. **F. B. Doane** was elected chairman of the board, in addition to his duties, since 1944, as president. **Carl E. Betz** was appointed vice-chairman of the board. He was formerly executive vice-president. **W. E. Thomas** assumes the title of executive vice-president, after serving as vice-president-sales, since 1946. **Wylie D. Reid, Jr.,** has been named treasurer, in addition to his duties as 2nd vice-president and plant manager.

William F. Harper has been appointed administrative assistant to **William E. Butts,** president, General Metals Corp., San Francisco. He was formerly with Consolidated Vultee Aircraft Co., San Diego, Calif.

Robert M. Breckenridge will head the new St. Louis sales zone of Selas Corp. of America, Philadelphia. Prior to his association with Selas, he was with Stokes and Smith Div., Food Machinery & Chemical Corp. and Budd Mfg. Co., both of Philadelphia.

C. J. Chapman has been appointed general sales manager, industrial products, National Carbon Co., Div. Union Carbide and Carbon Corp. He will be located in the company's New York Offices.

Robert J. Ely has been appointed assistant chief metallurgist for the American Brake Shoe Co. Formerly process metallurgist, he joined the company in 1945.

Herbert J. Cutler, Jr., has joined the American Fire Clay & Products Co., Canfield, Ohio, as sales engineer. He was formerly with American Radiator and Standard Sanitary Corp., Buffalo, N. Y., as plant metallurgist.

Gene A. Zwerner has been appointed district manager of Link-Belt Co's., Washington, D. C. office. He replaces C. R. Heller, who retired July 31. For the past four years, Mr. Zwerner has been sales manager for Link-Belt Africa Limited.

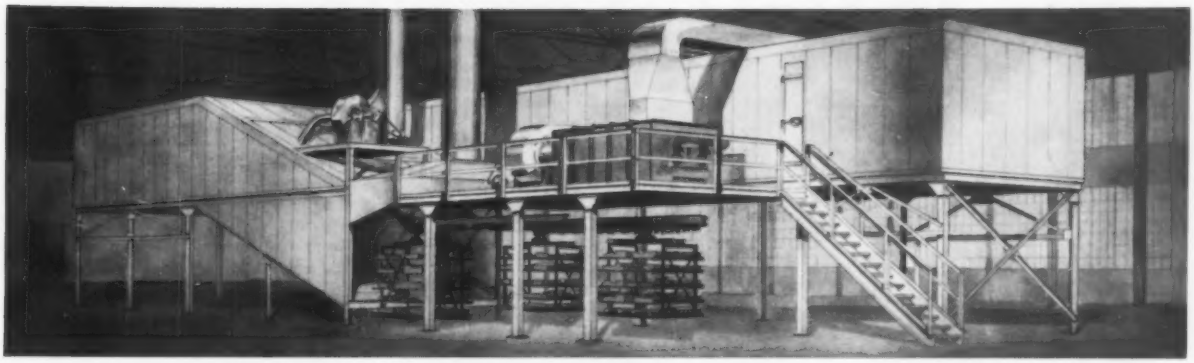
continued on page 28

G. Lambert . . . I.B.F. secretary

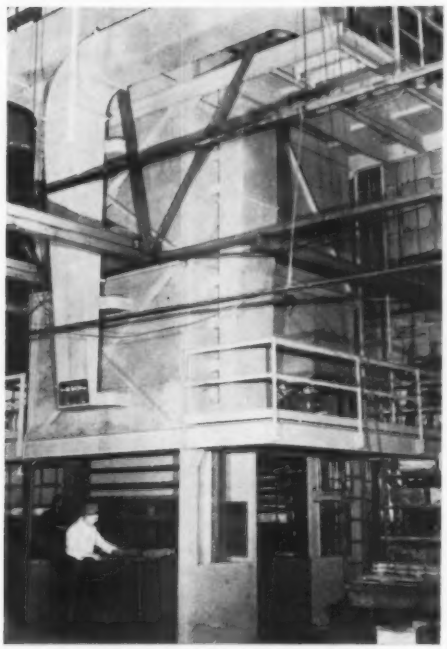
H. Brown . . . exchange author

F. B. Doane . . . board chairman

G. A. Zwerner . . . district mgr.



CARL-MAYER HORIZONTAL MONORAIL CORE OVEN at Eclipse Aviation Co. Patent No. 2355814.



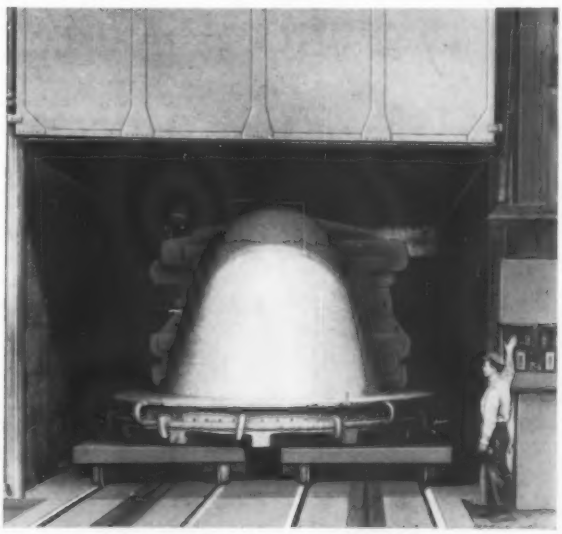
CARL-MAYER VERTICAL CORE OVEN at G.&C. Foundry Co. Patents No. 2,628,087 and 2,257,180.

"BIG" *engineering brings big foundry oven jobs to—*

CARL-MAYER

Carl-Mayer designs embody patented features which contribute to highest efficiency and economy in operation.

It will pay you to consult us on your next core baking and mold drying problem. We build ovens of all types and sizes, also other types of industrial ovens and furnaces. WRITE FOR BULLETIN NO. 53-CM.



CARL-MAYER MOLD OVEN. One of a battery of two at Pittsburgh Steel Foundry Corp. Capacity: 100 tons per charge (each oven). Patented.

CARL-MAYER CORE AND MOLD OVENS ARE SERVING CONCERNS LIKE THESE:

Aluminum Co. of America
American Brake Shoe Co.
American Radiator Co.
Ashland Malleable Iron Co.
Blaw-Knox Co.
Brown Industries
Buick Motor Div. of General Motors Corp.
Bucyrus-Erie Co.
Cadillac Motor Div. of General Motors Corp.
Centre Foundry Co.
Columbia Steel Corp. (U. S. Steel Corp.)
Crucible Steel Castings Co.
Dunkirk Radiator Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fremont Foundry Co.
G. & C. Foundry Co.
General Electric Co.
General Motors Corp. and Subsidiaries
Gilbert & Barker Co.
General Steel Castings Co.
Golden Foundry Co., Inc.
Henry Kaiser Corp.
W. O. Larson Foundry Co.
Mesta Machine Co.
F. E. Meyers & Bro. Co.
Oil Well Supply Co. (U. S. Steel Corp.)
Packard Motor Car Co.
Pittsburgh Steel Foundry Corp.
H. B. Salter Co.
Shenango Penn Mold Co.
Standard Foundry Co.
Union Brass & Metal Mfg. Co.
Union Steel Castings Co.
West Michigan Steel Castings Co.
A. C. Williams Co.
Whiten Machine Works
Whiting Corp.

THE CARL-MAYER CORPORATION

3030 Euclid Ave., CLEVELAND, OHIO

Backed by reputation and over 30 years' Experience

4 IMPROVED IRON, BETTER CASTINGS

F. J. Walls . . . Hoyt lecturer

continued from page 26

F. J. Walls, International Nickel Co., Detroit, has been chosen to be the 1955 AFS Charles Edgar Hoyt Annual Lecturer. He was chosen because of his continued interest in improving the quality level of foundry education, his long service to AFS, and his contributions to the foundry industry as a whole. Mr. Walls is a past president of AFS.

George H. Caligan has been appointed sales manager of the American Refractories & Crucible Corp.

Paul Gordon has been appointed associate professor metallurgical engineering at the Illinois Institute of Technology, Chicago. He was an assistant professor in metallurgical engineering at Illinois Tech before joining the faculty of the University of Chicago in 1951.

C. L. Thompson has been appointed sales manager of the Material Handling Div., The Buda Co., Div. Allis-Chalmers Mfg. Co. He was formerly general manager of the Oregon Branch of The Buda Company.

J. Douglas James has been appointed general manager of the Urick Foundry Co., Erie, Pa. Prior to his appointment he was superintendent of foundry operations at the Cooper-Bessmer Corp., Grove City, Pa. He is one of the founders and past chairman of the Northwestern Pennsylvania Chapter of AFS.

C. C. Blandy has been appointed new Philadelphia district sales engineer for J. H. France Refractories Co., Snow Shoe, Pa. In his new capacity, he will work with the Van Brunt Co., Philadelphia, distributors of the company's products.

Dr. L. F. Mondolfo has been appointed director of metallurgical engineering at the Illinois Institute of Technology, succeeding Dr. Otto Zmeskal who has accepted the position of research professor at the University of Florida, Gainesville, Fla.

William H. Brandt, assistant secretary of Chain Belt Co., Milwaukee, has retired after more than 44 years of service. **W. E. Schauer** has been appointed as his successor. Mr. Schauer was formerly an administrative assistant in the financial department.

James W. Jones is now district representative for Cooper Alloy Foundry Co., Hillside, N. J. His territory will include the states of Tennessee, Alabama, Georgia, Mississippi, and Florida.

R. G. Hartnett has been named service engineer for Acheson Colloids Co., Port Huron, Mich., and will work out of the Cleveland office, covering the entire state of Ohio.

F. J. Halligan has been made sales manager of Doran Manganese Bronze Co., Brooklyn, N. Y. He was most recently assistant manager, foundry products division, Baldwin-Lima-Hamilton Co.

Stanislaw T. Jazwinski has been appointed director of research for Barium Steel Corp's. subsidiaries: Central Iron & Steel Co., Harrisburg, Pa.; Phoenix Iron & Steel Co., Phoenixville, Pa., and Chester Blast Furnace, Inc., Chester, Pa. He was formerly chief research metallurgist for the companies with whom he is now associated.

Alfred A. Diebold, vice president of operations, Atlas Steel Casting Co., has also been placed in charge of sales for the firm. He has been with the company for over 35 years.

C. F. McGunigle is now vice-president, Syntron Baltimore Sales Co., Baltimore, Md. He went to Baltimore from Syracuse, N. Y., where he headed the local Syntron organization.

After 18 years in the organization, **S. H. Newburn** has been named president of Air Reduction Canada, Ltd., Montreal. He comes to the new post from his most recent apointment as regional manager for the North Central Region, with offices in Chicago.

V. A. Olson has been made manager, Airsupply Co., Beverly Hills, Calif. He began with the firm in 1939 as sales engineer, later becoming assistant manager. Airsupply is a division of the Garrett Corp., Los Angeles.

George H. Morel has been named as district engineer for the construction and maintenance department of American Brake Shoe Co. in the Chicago area. He has been with the company for 12 years.

W. E. Eccles has been promoted to foundry superintendent at Cooper-Bessemer Corp's. Grove City, Pa., plant. He began with the firm as machinist apprentice in 1928, has been assistant foundry superintendent since 1942.

Alhambra (Calif.) Foundry Co., Ltd., has announced the election of new officers and directors: **C. E. Hopping,** board chairman; **J. S. Ashton,** president; **P. C. Seichert,** secretary-treasurer and general manager; **R. J. Hopping,** vice-president in charge of purchases; **G. A. Hopping,** vice-president in charge of sales; **G. H. Meyn,** director and general superintendent; **J. T. Sofranko,** director.

W. E. Horst recently joined Foote Mineral Co.'s research and development department as a metallurgical engineer.

Edward F. Peck has been appointed advertising and publicity manager for Continental Foundry & Machine Co. His offices will be in Pittsburgh, Pa., where Continental is establishing headquarters for publicity, advertising and promotion. For the past 10 years he has been associated with the industrial advertising and promotion department of Westinghouse Electric Corp.

continued on page 30

J. D. James . . . general mgr.

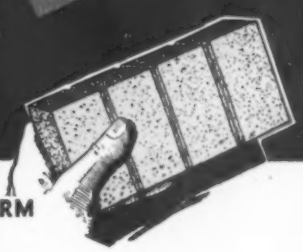
S. T. Jazwinski . . . research dir.

A. A. Diebold . . . heads sales

E. F. Peck . . . adv. manager

...for IMPROVED IRON, BETTER CASTINGS

Famous CORNELL CUPOLA FLUX



pre-measured
SCORED BRICK FORM
(Approx. 4 lb. brick)

SERVING LEADING GRAY IRON FOUNDRIES AND MALLEABLE FOUNDRIES WITH CUPOLAS SUCCESSFULLY FOR MORE THAN 36 YEARS

By using Famous Cornell Cupola Flux with every cupola charge, you will insure castings that are sounder, cleaner and easier to machine.

CUPOLA OPERATION WILL BE MORE EFFICIENT. Drops will be cleaner, reducing digging out time amazingly. There will be less erosion of cupola lining, due to the formation of a glazed or vitrified surface on brick or stone—less repairs.

THE SCORED BRICK FORM makes fluxing of molten iron a matter of seconds, and the correct amount can be used for any size of cupola charge—no waste.

WRITE FOR BULLETIN NO. 46-B

THE CUPOLA before using Famous Cornell Cupola Flux.

THE CUPOLA during the use of Famous Cornell Cupola Flux.

The Cleveland Flux Co.

1026-1040 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes – Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

BRASS FLUX

FAMOUS CORNELL BRASS FLUX cleanses molten brass even when the dirtiest brass turnings or sweepings are used. You pour clean, strong castings which withstand high pressure tests and take a beautiful finish. The use of this flux saves considerable tin and other metals, and keeps crucible and furnace linings cleaner, adds to lining life and reduces maintenance.

ALUMINUM FLUX

FAMOUS CORNELL ALUMINUM FLUX cleanses molten aluminum so that you pour clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections can be poured. Castings take a higher polish. Exclusive formula reduces obnoxious gases, improves working conditions. Dross contains no metal after this flux is used.

continued from page 28

J. A. Ogle of Jack Ogle & Co., Seattle, is Washington state representative for Precision Castparts Corp., Portland, Ore., a precision casting and shell molding firm.

E. O. Prange has been appointed sales representative by Alexander Saunders & Co., New York. He will handle equipment and supplies for precision investment castings in Ohio, Michigan and Indiana.

R. I. Ray has been appointed Chicago area representative of Baird Associates, Inc., Cambridge, Mass. He has had 15 years' experience in control instrumentation and the production of copper base alloys and related products.

Sam Tour & Co, Inc., New York, has organized a Non-Destructive Testing Dept., of which **J. K. Bell** has been named head. Mr. Bell is a New York University graduate and has been active in the design and installation of chemical plants.

A. J. Tomasek, formerly executive vice-president, Walsh Refractories Corp., St. Louis, has been named president of the organization. **J. J. Duggan** was elected vice-president and retains his title as manager, glass refractory sales. **W. K. Schweickhardt** was promoted to vice-president, continues as manager, refractory sales. **P. L. Hershfield** remains as chairman of the board and chief executive officer.

S. H. Stupakoff, former president, Stupakoff Ceramic & Mfg. Co., Latrobe, Pa., has been elected vice-president, Carborundum Co., Niagara Falls, N. Y. The Stupakoff Co. was acquired by Carborundum early in 1954 and was made a division of that organization.

Leonard Romano recently joined Penola Oil Co. as core oil sales representative. Prior to joining Penola he was associated with Packard Motor Car Co. as foundry laboratory engineer. He joins the Penola Detroit staff to inaugurate more complete core oil service in the Michigan area.

W. H. Dashiell, formerly with Kindt-Collins Co., will represent P M S Co., Cleveland, in Wisconsin, Illinois, Missouri, Kansas, Iowa, and Nebraska.

Vernon W. Swan has been promoted to manager, plant five, Reynolds Metals Co., Louisville, Ky. He has been ingot products supervisor at the company's sales headquarters for three and one-half years.

C. B. Murton has joined the sales department, Vesuvius Crucible Co., Swissvale, Pa. Mr. Murton was a sales representative for Kaiser Aluminum & Chemical Sales, Inc., Refractory Div.

Victor Emil Vallet, president, Giffels & Vallet, Detroit, has been awarded the honorary degree of doctor of engineering by the University of Colorado, from which he received a B.S. (CE) in 1916.

G. L. Weissenburger, president, Keokuk (Iowa) Electro-Metals Co., is making an informal survey of ferro alloy and steel plants in Europe, in connection with an appointment by the National Assn. of Mfrs. as a member of the U.S. delegation to the second annual International Conference of Manufacturers at Paris.

William Blackie has been named executive vice-president, Caterpillar Tractor Co. While functioning at a top administrative level, he will continue to give administrative direction to the company's plants and subsidiaries.

Carl F. Barchfeld has been appointed sales manager of the Crucible Steel Casting Company, Cleveland. He was formerly associated with the Commercial Steel Casting Company, since 1937, and prior to that was with American Steel Foundries at Pittsburgh and Verona, Pa.

Kenneth Iverson has been appointed chief metallurgist of the Cannon-Muskegon Corp., Muskegon, Mich. He had recently served as metallurgist on special assignments for the Indiana Steel Products Co., Valparaiso, Ind., and prior to that was metallurgist and chief engineer for the Illium Corp., Freeport, Ill.

H. W. Hundley, manager of National Lead Company's Cincinnati branch since 1943, retired recently after 47 years in the firm. Other changes in that branch included: **S. R. Hollingsworth,** manager, metal division; **C. J. Surman,** manager, paint division; and **W. W. Howard,** manager, pigments division.

Clyde M. Adams, secretary, Bohn Aluminum & Brass Corp., Detroit, has been appointed director, Aluminum-Magnesium Div., Business and Defense Services Administration, U. S. Department of Commerce, Washington, D. C. Mr. Adams is on loan from his company under a rotation system under which industry makes available the services of experienced personnel without compensation from the government for limited periods of time.

John A. Wagner, president, Wagner Malleable Iron Co., Decatur, Ill., was recently presented the 1954 Charles H. McCrea award for outstanding service to the malleable iron castings industry. The presentation was made at the annual banquet of the Malleable Founders' Society, held at the Siegniory Club, Montebello, Quebec, Canada, by **C. C. Chambers,** president, Texas Foundries, Inc., Lufkin, Texas.

J. E. M. Wilson has been elected vice-president in charge of sales for Jeffrey Mfg. Co., Columbus, Ohio. Mr. Wilson immediately announced the appointment of **A. R. Anderson** as general manager of sales, mining division; **Lincoln Kilbourne,** general manager of sales, conveyor division; and **J. B. McNaughton,** general manager of sales, special products division.

Robert B. Wittenberg has been elected a vice-president of Great Lakes Carbon Corp., New York City, and appointed general manager of its Electrode Div. He had been general manager of the Chemical Div., General Tire & Rubber Co., Akron, Ohio, since 1951.

Conde Hamlin, formerly general sales manager of DeWalt, Inc., Lancaster, Pa., subsidiary of American Machine & Foundry Co. has been elected vice-president in charge of sales and a director of DeWalt.

L. Romano . . . joins Penola

K. Iverson . . . chief metallurgist

C. F. Barchfeld . . . sales mgr.

R. B. Wittenbert . . . vice-pres.

For cleaner castings at lower cost . . . use RESINOX

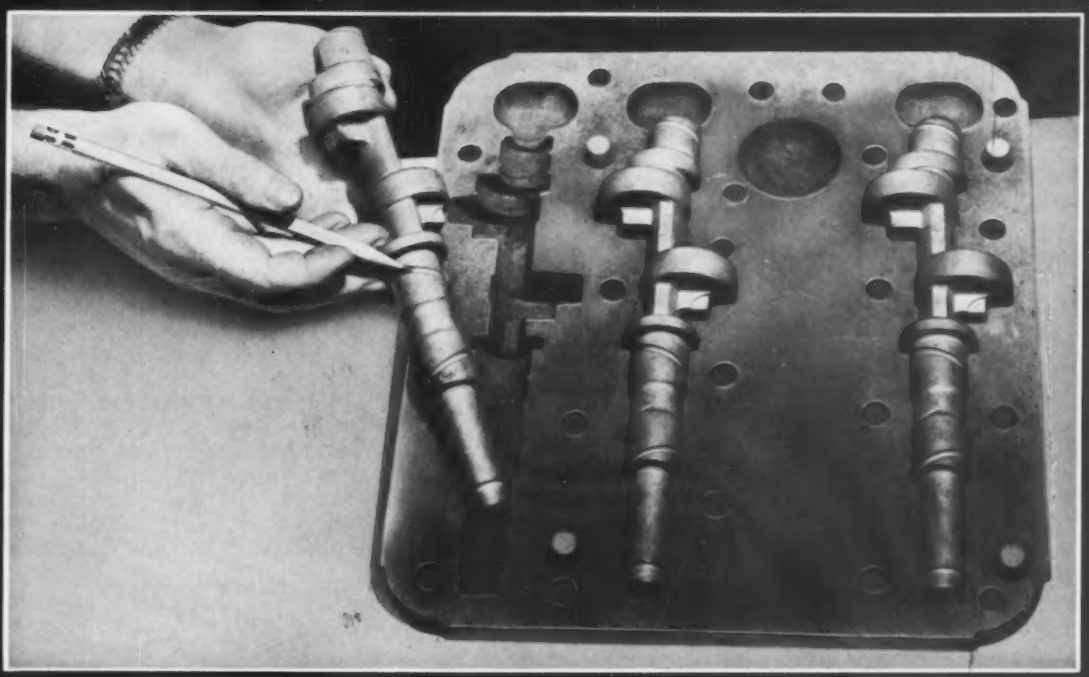


Photo courtesy of Century Foundry Co., St. Louis, Mo.

As an experienced foundry man, you know that the quality of your shell molds depends on the quality of the bonding resins used. That's why leading foundries prefer Monsanto's *Resinox** shell molding resins. The results speak for themselves – like the clean, close-tolerance casting shown here.

Because of built-in characteristics, Resinox helps produce superior castings, clean stripping and closer tolerances with low resin-to-sand ratio. You can expect stronger, better-bonded shells which mean faster production, less finish-machining and fewer rejects. Resinox helps you take fullest advantage of the superior quality and production savings inherent in the shell molding process.

For complete information on shop-tested Resinox shell molding resins; phenolic and Resimene* urea resins for core binding; and Lytron* sand conditioner for conventional sand casting, mail this convenient coupon today.

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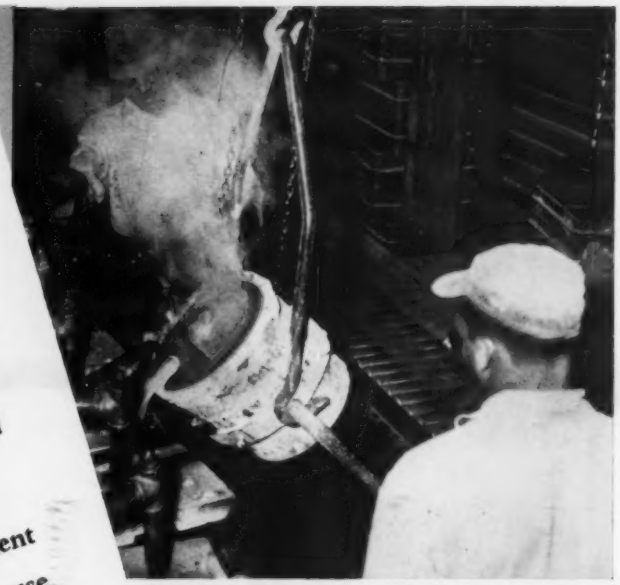

Scene in bronze valve foundry of the Belknap Manufacturing Company, Bridgeport, Conn. Illustrates the use of preformed ladle liner, in this case, made with skimmer and bottom pour tube. Pure metal is assured by automatic separation from slag and dross. Capacity of liner, 250 lbs. brass.

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For more data, circle No. 556 on postage-free Reader Service card on p. 17 or 18

Talk of the Industry

PLASTIC IMPREGNATED MAHOGANY with high dimensional stability and heat resistance is being used experimentally for shell mold patterns. The material has been held for 41 hours at up to 400 F without charring and its use for, say, 1000 impressions is considered entirely feasible. High resistance to moisture also makes the new material especially useful for Keller patterns and other precision pattern work.

LATEST in the steadily expanding service of AMERICAN FOUNDRYMAN to the foundry industry is the coding of advertisements and inclusion of code numbers on the postage-free Reader Service postcards (pages 17-18). Object is to simplify contact between readers and advertisers. Just fill in your name, title, and address, circle the numbers of the advertised products and services in which you're interested, and drop the card in the mailbox. (Same card works for Here's How, Products & Processes, and Free Foundry Information.) If you write to the advertiser direct, tell him you saw his advertisement in AMERICAN FOUNDRYMAN.

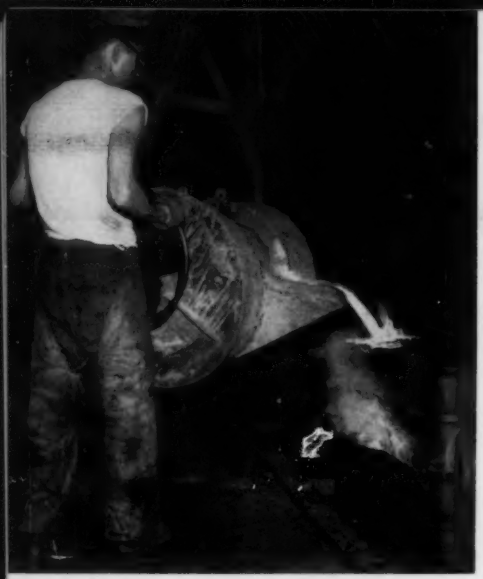
FLEXIBLE CERAMIC COATINGS with numerous foundry applications have been developed by Samuel W. Bradstreet, Jr., and J. Scott Griffith of Armour Research Foundation. Foundry uses include: coatings for molds, cores, chills, inserts, stoppers, runners, crucibles or holding ladles, and die-casting and permanent mold dies, reservoirs, and metal pumps . . . facings and upgrading molding sands . . . high-temperature coatings for thermocouples. Called "solution ceramics," the new coatings can be applied to almost any clean solid surface at a few hundred degrees Fahrenheit. Applied from chemical solutions, the new materials are reported to be easy to apply and to require no expensive equipment, to be accurately controllable for thickness with films from a few millionths to 0.01 in. possible, to be able to protect metal from attack by molten metal or slag, and to provide a base for anchoring other coatings.

BENTONITE derivative developed from western bentonite and petroleum oils is being used experimentally as a binder in production of precision green sand castings. Gears cast in alloy iron required no machining; investigators believe the new binder will be useful in molds for all alloys. Sand bonded with the material is re-usable and is mixed and molded without special techniques or equipment.

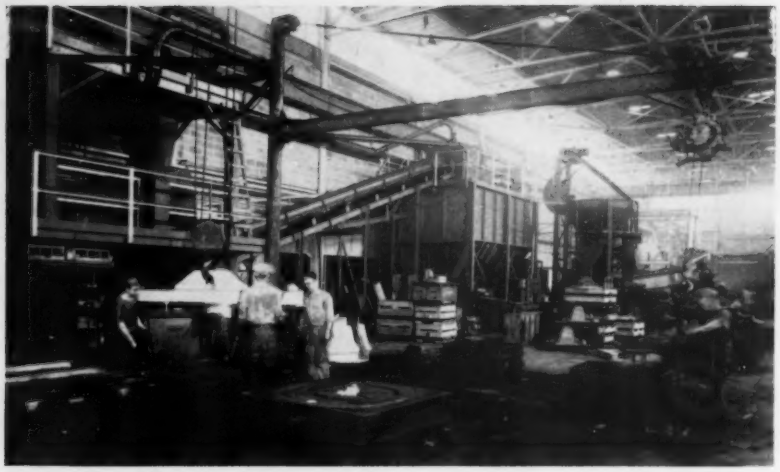
TEN-FOLD INCREASE in use of investment castings within the next five years is predicted by the Investment Casting Institute. Sales volume in 1953 is estimated at $250 million. The Institute sees unlimited non-defense use of investment castings in applications calling for intricate, precise, finished-to-size shapes and difficult-to-machine alloys.

COMPOSITE MOLD for centrifuging or semi-centrifuging of metal is suggested by Prof. D. C. Williams, Ohio State University. Pointing out that the rotating mass tends to rupture from the center, rather than the periphery, he proposes that such molds have dry sand centers with green sand for the outer portions.

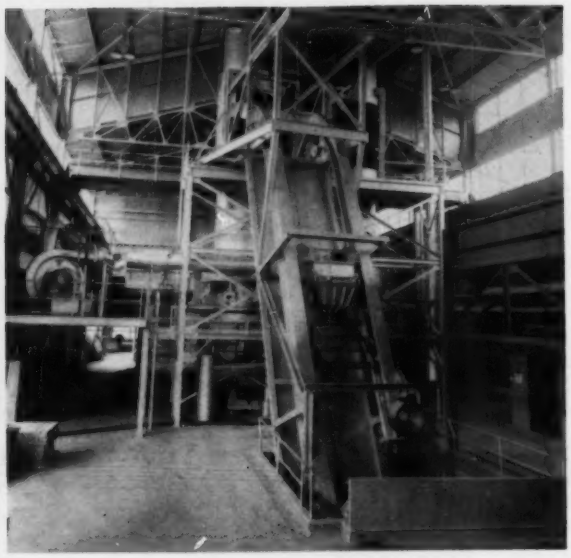
LACK OF DUCTILITY at high strength, a limitation in ordnance use of titanium alloys, has been overcome in a new alloy developed for Watertown Arsenal Laboratory by Armour Research Foundation. The new material (6% Al, 4% V) is 45% lighter than steel, has 14% elongation, 45% reduction in area when heat treated to 190,000 psi tensile strength. Charpy impact is 11 ft-lb at -40 F.



Pouring molds on the No. 2 line. Side draft hood exhausts fumes.



Heavy molding area with slinger, sand storage, and sand preparation in background. Molds are handled by crane and floor-level roller conveyor.



Charging bucket on return trip for another load of fuel and metal. Charger serves both cupolas.

What They Say About F-M Kansas City

Robert H. Morse, Jr., president, Fairbanks, Morse & Co. . . . "The Kansas City plant is evidence of our confidence in the economic future and the future of Fairbanks-Morse."

John R. Walsh, general manager, F-M Kansas City Works . . . "Being a good neighbor in the community and providing safe, healthful, and comfortable working conditions for the employees were foremost in our minds in planning the new pump and engine works."

Leslie G. Graper, foundry superintendent, F-M Kansas City . . . "Performance and efficiency of certain types of pumps, particularly centrifugals, are greatly affected by precision and finish of wet surface. Conventional methods of using many hand operations to bring completed pumps up to standard are largely avoided by the Fairbanks-Morse methods of precision casting."

Lester B. Knight, president, Lester B. Knight & Associates, Inc., Chicago . . . "Everything was done to meet and exceed standards of health, safety, and good working conditions set by the American Foundrymen's Society."

Two views of No. 1 molding line. Jacket shifting is done at right background.

No. 2 molding unit is for intermediate castings. Molds from the slinger and the jolt-rollovers are finished and closed on the conveyor which takes them to the pouring station shown on the facing page.

Open Model Gray Iron Foundry

HERBERT F. SCOBIE / *Editor*

■ It's the most! The new Fairbanks, Morse & Co. foundry in Kansas City, Kan., that is.

Designed for 82 tons of castings a day, this new plant is the most modern, most flexible, most mechanized foundry to combine both production and jobbing operations. Normal output in one shift is somewhat less—about 60 tons of gray iron, 5 tons of brass and bronze, and a ton of stainless steel. Castings range from 15 to 2200 lb, averaging about 45 lb, and are used in production of F-M pumps (up to 16-in. flow) and one-cylinder, four-cycle engines (2-30 hp). The new foundry is part of the new Fairbanks-Morse pump and engine works dedicated May 19-20.

In reality three foundries under one roof, the new plant occupies 147,600 sq ft of floor space on a 38½-acre tract that three years ago was so deep in the flood waters of the Kansas River that only cupolas, tower core ovens, and overhead cranes would have been visible. Levees now guard against the possibility of such a disaster.

First floor of the building is 290 x 420 ft and contains all the major production areas. Two second floor areas totaling approximately 22,000 sq ft are devoted to coremaking, pattern storage, and wash and locker rooms. An additional 4800 sq ft are in the third floor of the core department.

Two hundred and fifty employees man the foundry and enjoy the facilities and working conditions provided in its modern steel and brick structure. Every possible precaution has been taken to make the plant a desirable industrial neighbor as well as "a good place to work." In addition to usual mechanical safeguards, safety clothing (safety glasses or goggles must be worn by everyone), and equipment, the foundry is well ventilated, well lighted, and has ample aisle space.

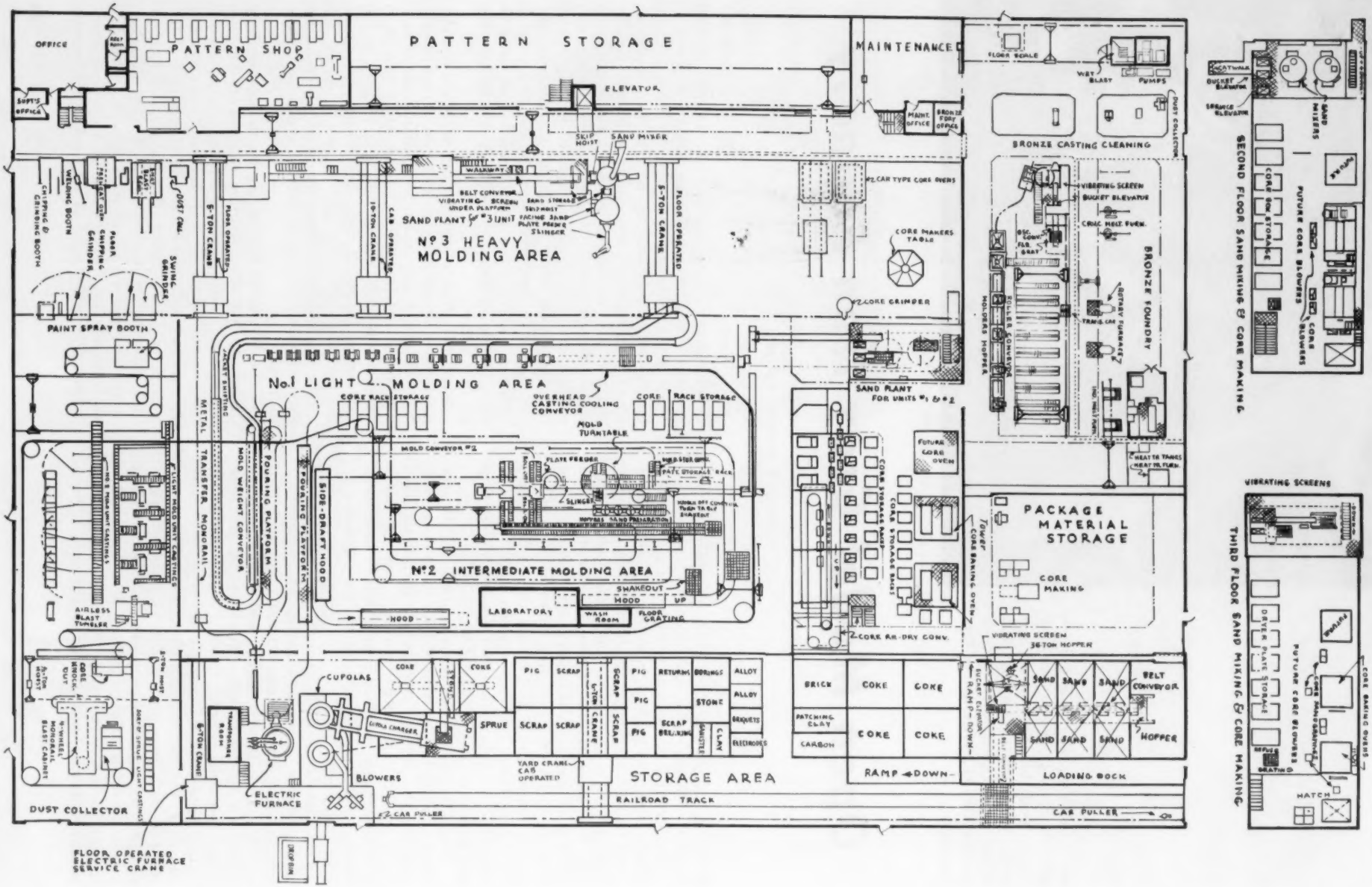
Air in the foundry is changed every three minutes. Compensating air brought directly into shake-out hoods, pouring hoods, and similar enclosures provides about 10 per cent more air than is being exhausted at these points. Result is better control of fumes and particulate matter as well as reduced heating cost. A roof exhaust fan above the electric furnace keeps the atmosphere in that area clean. In all, 40 fans with ratings up to 10 hp are used for smoke and fume removal, while another 14 ranging up 100 hp are used for dust removal.

Steam heat from a central plant keeps the foundry comfortable in cold weather by means of unit heaters. Natural light is augmented by combinations of mercury vapor and incandescent lights which provide a minimum of 35 foot-candles of light with up to 100 foot-candles in critical areas such as core room, cleaning, and molding.

The combination lighting fixtures are used so that the desired intensity is developed without color distortion.

Wet collection of dust is used for the sand mullers, shake-outs, and blast cleaning equipment. The two cupolas have water-curtain spark and cinder suppressors. Water from these and the continuous wet slag disposal flush solid matter alternately into one of two settling tanks for sedimentation and removal by clamshell. Lockers are fan-ventilated in the up-to-date, second-floor locker and shower rooms. A central first aid room has a registered nurse on duty at all times.

Some 3000 active patterns are used in the foundry


OFFICE
PATTERN SHOP
PATTERN STORAGE
MAINTENANCE
ELEVATOR
SKIP HOIST
SAND MIXER
WALKWAY
BELT CONVEYOR
VIBRATING SCREEN
SAND STORAGE
SKIP HOIST
FACING SAND
PLATE FEEDER
SLINGER
SAND PLANT FOR #3 UNIT
No 3 HEAVY MOLDING AREA
5-TON CRANE
PLANK OPERATED
10-TON CRANE
CAB OPERATED
FLOOR OPERATED
#2 CAR TYPE CORE OVENS
CORE MAKERS TABLE
#2 CORE GRIMPER
CHIPPING & GRINDING BOOTH
WELDING BOOTH
PORTABLE CHIPPING GRINDER
PLANK CHIPPING GRINDER
DUST COLL.
SWING GRINDER
PAINT SPRAY BOOTH
No 1 LIGHT MOLDING AREA
CORE RACK STORAGE
OVERHEAD CASTING COOLING CONVEYOR
CORE RACK STORAGE
MOLD TURNTABLE
MOLD CONVEYOR #2
PLATE FEEDER
PATTERN STORAGE RACK
SLINGER
HOPPER SAND PREPARATION
JACKET SHUTTING
METAL TRANSFER MONORAIL
MOLD WEIGHT CONVEYOR
POURING PLATFORM
FOUNDING PLATFORM
SIDE-DRAFT HOOD
No 2 INTERMEDIATE MOLDING AREA
SHAKEOUT HOOD
LABORATORY
WASH ROOM
FLOOR GRATING
HOOD
AIRLESS BLAST TUMBLER
DUST COLLECTOR
FLOOR OPERATED ELECTRIC FURNACE SERVICE CRANE
CUPOLAS
CORE
CORE
SPRUE
PIG
SCRAP
SCRAP
SCRAP
PIG
PIG
PIG
RETURNS
SCRAP BRIQUETTING
BORINGS
STONE
SAND CLEANING
ALLOY
ALLOY
BRIQUETS
ELECTRODES
CLAY
BRICK
PATCHING CLAY
CARBON
COKE
COKE
COKE
COKE
RAMP DOWN
STORAGE AREA
YARD CRANE CAB OPERATED
BLOWERS
ELECTRIC FURNACE
RAILROAD TRACK
CAR PULLER
CAR PULLER
LOADING DOCK
FLOOR SCALE
WET BLAST
PUMPS
MAINT. OFFICE
BRONZE FOUNDRY OFFICE
DUST COLLECTION
BRONZE CASTING CLEANING
VIBRATING SCREEN
BUCKET ELEVATOR
CRUC. MELT FURN.
DEC. CONVEY. FLR. GRAT
BRONZE FOUNDRY
ROLLER CONVEYOR
MOLDERS HOPPER
TRANS. CAR
ROTARY FURNACES
HEAT TR. TRANS. HEAT TR. FURN.
SAND PLANT FOR UNITS #1 & #2
FUTURE CORE OVEN
CORE STORAGE RACKS
CORE STORAGE RACKS
TOWER CORE BAKING OVEN
#2 CORE AIR-DRY CONV.
PACKAGE MATERIAL STORAGE
CORE MAKING
VIBRATING SCREEN
35 TON HOPPER
BELT CONVEYOR
SAND
SAND
SAND
SAND
SAND
SAND
HOPPER
BUCKET ELEVATOR RAMP DOWN
RAMP DOWN
SECOND FLOOR SAND MIXING & CORE MAKING
CATWALK
BUCKET ELEVATOR
SPRINKLER ELEVATOR
SAND MIXERS
CORE SAND STORAGE
FUTURE CORE BLOWERS
CORE BLOWERS
CORE BLOWERS
VIBRATING SCREENS
THIRD FLOOR SAND MIXING & CORE MAKING
DRYER PLATE STORAGE
FUTURE CORE BLOWERS
CORE BAKING OVENS
HATCH

Layout of Fairbank-Morse Kansas City foundry. Position of second and third floor areas for coremaking and sand mixing can be fixed by locating tower core ovens. Second floor locker rooms and pattern storage over office, pattern shop, first floor pattern storage, and maintenance are not shown. ←

→ **Two high-speed mullers are automatically controlled for cycle, moisture, and bond additions.**

and an additional 4000 are used occasionally. A pattern shop, fully equipped for production and maintenance of patterns, is located on the north side of the building. Patterns are stored on the first and second floor adjacent to the pattern shop. A freight elevator simplifies pattern transfer.

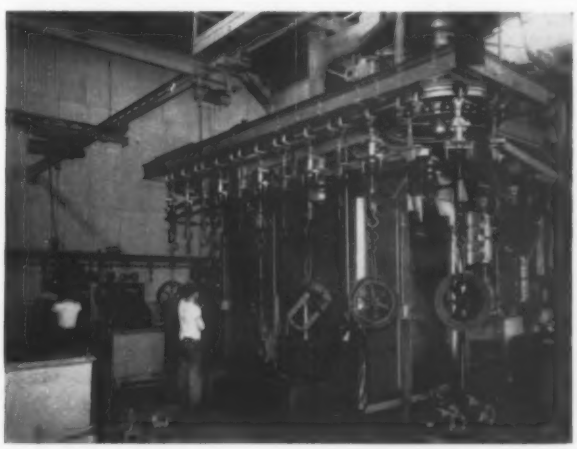
Bulk of castings production is in the gray iron shop which makes up the major portion of the foundry. Gray iron molding is done in three areas mechanized to handle light, intermediate, and heavy castings. The three molding units are parallel to each other and to the materials storage and melting area (see layout) all of which are adjacent at one end to the cleaning and finishing departments. At the opposite end of the molding and melting areas are the core making and sand preparation departments. Result is a generally straight-line flow of materials from east to west. The northeast corner of the plant is a self-contained brass and bronze foundry and stainless steel shop.

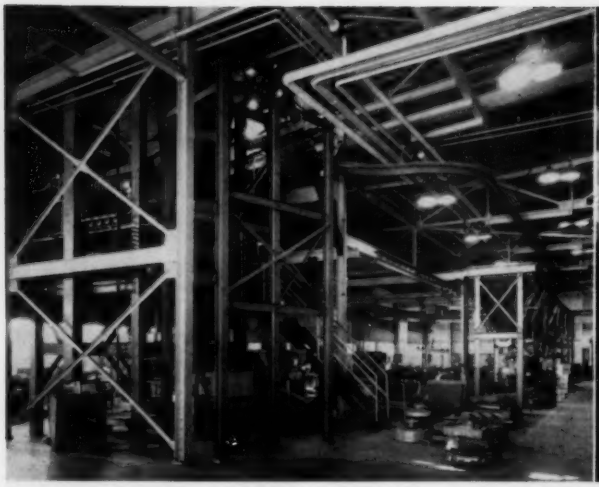
Raw materials enter the building at the southeast corner where trackage extending almost the length of the plant runs parallel to and just inside the south wall. Sand is delivered in closed hopper cars and dropped through a floor grate on to a belt conveyor which takes it to a bucket elevator at the rate of 30 tons an hour. The elevator discharges through a vibrating screen on to a belt that travels above three pairs of 100-ton concrete storage bins. Plows divert the sand into storage as desired. This sand is used for cores, some of which break down to keep up molding sand volume. As originally made up, molding sand was a natural Iowa material but will gradually become converted to the Wisconsin sand used in the cores.

Sand is clamshelled out of the bins into two 36-ton storage hoppers above the core sand muller by the crane that spans the entire materials storage area. Core oil is stored outside the building in a 12,000-gal underground tank and pumped to a gravity-feed tank over the muller. A travelling weigh larry with 17-cu ft capacity weighs the sand before it goes into the muller which prepares sand at the rate of 10 tons per hour. Prepared core sand is delivered pneumatically at 60 psi pressure to a third-floor bin with four separate compartments providing storage for four core mixtures.

Electric furnace provides 11-ton storage capacity for cupola melted iron to meet varying demands.

Continuous monorail airless-blast cabinet cleans intermediate castings from No. 2 molding line.





Unit at left mixes bronze foundry sand, automatically delivers it to hoppers in background.

Hand finishing section of cleaning room where light and intermediate castings are ground.

Core mixtures are delivered manually by rubber-tired dump cart to grated floor openings over the hoppers of the second-floor core blowers and benches. The man handling this also fills the hoppers of the automatic bond-addition cells used with the molding sand mullers for the light and intermediate floors.

A switch in the pneumatic core mix delivery pipe enables batches to be blown to an octagonal core bench at the east end of the heavy molding floor where large bench and floor core making is handled. An intercom system enables this department to let the sand mixing center know the type of sand desired. Cores made in this area are baked in two car-type ovens. A core grinder simplifies finishing and fitting of large cores.

In a small core department occupying part of the packaged materials area, special core mixes for complex impellers and other special castings are prepared in a portable muller. Cores made here are baked in a small, drawer-type oven that can be fired by either oil or gas. Cores for the non-ferrous foundry are also made here. Wire cutting and straightening is handled in the special core department.

Cores made range from a few ounces to 2000 lb in weight with most being produced by blowers in the second-floor core room. Core blowers and benches are located adjacent to the two tower ovens (there's space for a third) so cores can be loaded as made. These ovens can be fired by either gas or oil; conveyors have variable speeds of 2 to 8 in. per min. Baked cores are unloaded on the main floor in the core finishing area where they are cleaned, assembled, gauged, coated, and finally put through an overhead, horizontal re-dry oven. Cores pass through the re-dry oven on a continuous pendant conveyor and are loaded and unloaded at ground floor level. Finished cores are stored on racks beside the molders on the light and intermediate units.

Molding sand for the light and intermediate molding units is prepared in a pair of high-speed mullers, each capable of turning out 40-50 tons of sand per hour. Above each muller is an 80-ton return sand and a 20-ton new sand storage bin. Sand is mixed on a predetermined cycle with moisture controlled and bond measured and added automatically.

The mullers discharge on either side onto parallel inclined belts, one supplying the light molding line, the other the intermediate line. Thus, either muller can be used to supply either line. Prepared sand is delivered to overhead, horizontal distribution belts after passing up the inclined belts and through aerators. Spill sand that goes through floor grates at the molding machines, shake-out sand, and sand that goes over the end of the supply belt return by underfloor belt, over a magnetic pulley, and into the boot of a bucket elevator. The elevator discharges on to a vibrating screen above the storage hopper. Each of the two systems has complete distribution, return, elevator, screen, and storage facilities.

New sand is introduced at the shake-out and delivered by return belts and elevator to the new sand bin, when the system is not in use for production.

The light molding unit handles 275 molds an hour with an average metal requirement of 25 lb per mold —approximately 3½ tons per hr. The conveyor is 550 ft long and includes 110 cars of the tilt-top type. Usual travel rate is 10 ft per min but the speed can be varied from 5½ to 16½ ft per min. Molding equipment consists of six jolt-squeeze machines plus three jolt-squeeze-pin lifts for copes paired with three jolt-squeeze-rollovers for drags. Additional space has been allowed for two more machines or benches. The rollovers are served by short sections of monorail for easy transport of drags from machine to conveyor. Quick-release aluminum flasks and aluminum bottom boards are used on this molding loop.

Molds approaching the pouring area pass close to poured molds moving in the opposite direction for convenience in transferring jackets. Jacketed molds are automatically weighted by weights hung from a chain conveyor. The weights lower into position just prior to pouring and raise at the end of the pouring platform. Pourers use 400-lb covered ladles pushed manually on a monorail. Metal is brought to the pourers in 1000-lb cylindrical transfer ladles.

Poured molds move through a cooling tunnel paralleling the molding machines, then double back and pass an automatic shake-out. Here the tilt-top mold

cars are automatically raised on one side, the bottom board catching at the hinged edge while sand and casting slide on to the vibrating grate. Castings and gates are hooked off of the grate into metal boxes hanging from the overhead casting cooling conveyor. Sand goes through the shake-out on to the return sand belt and back to storage.

The intermediate molding unit has a production rate of 80 molds per hour with a metal requirement of seven tons per hour; 122 cars make up this 651-ft loop. While normal travel rate is 6 ft per min, this can be varied from 4 to 8 ft per min. Cars on this conveyor are the non-tilting type.

The intermediate unit uses tight steel flasks with bars in both cope and drag, eliminating the need for bottom boards. Molding equipment consists of a pair of roll-on, roll-off, jolt-squeeze-strip machines using 24-in. square flasks, and a hydraulically operated slinger with a four-station turntable.

The slinger-rammed molds are made in 38 x 42-in. flasks which come off one of the four sections of roll conveyor on the turntable on to a rollover unit. The mounted pattern goes back into the flask preparation circuit while the completed mold section moves in the opposite direction to the mold conveyor.

The entire intermediate molding loop is serviced by six monorail bridges for general flask and mold transfer, and two monorails for moving mold sections to the conveyor. An additional monorail and a monorail bridge handle shake-out and flask transfer.

Ease Materials Handling

Closed molds are clamped at the parting line on their way to the pouring area which parallels the pouring section of the light molding loop. Pouring on the intermediate line is done with 1600-lb cylindrical ladles synchronized to travel with the conveyor. When not in the pouring area, the ladles are moved by motor on a monorail. Like the light molding unit, the pouring section of the intermediate unit has a side-draft exhaust hood supplied with compensating air.

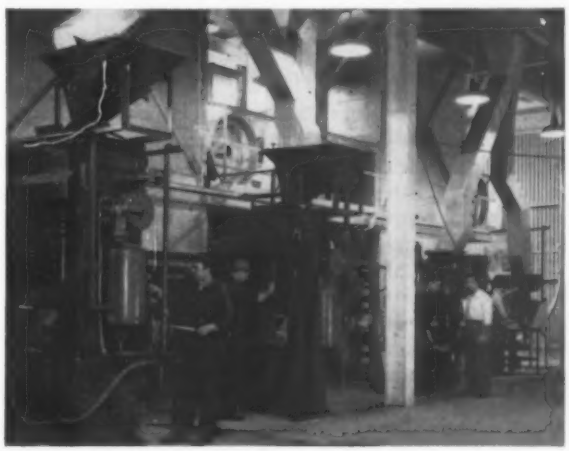
Shortly beyond the pouring line, the intermediate conveyor goes into a cooling tunnel and then goes below floor level for another loop about equivalent in length to its above-floor travel. In addition to providing extra travel for cooling, taking the conveyor below clears the floor for lift truck traffic to simplify materials handling around the molding equipment inside the loop.

A short distance from where the conveyor emerges to ground level is the cope shake-out. A monorail at right angles to the conveyor is used for lifting the cope, transferring it to the shake-out, then over to the roller conveyor that returns flasks to the molding machines. Around the corner of the conveyor from the cope shake-out is a monorail bridge that spans both mold conveyor and casting cooling conveyor. This is used for transferring castings to the cooling conveyor. Drags are shaken out a little farther on and directly opposite the end of the flask-return roller conveyor that parallels the flask-preparation area and the molding machines.

Metal for gray iron castings is melted in two 54-in. ID cupolas which are used on alternate days. Melting rate ranges from seven to 15 tons per hour and metal is tapped continuously by way of a front-slagging spout into a direct-arc electric furnace. The electric furnace has a cold melt rating of two tons per hour but its real function is to act as an 11-ton holding vessel to provide for variations in demand in the three gray iron molding areas. While one grade of iron is normally produced, adjustments in composition can be made conveniently in the electric furnace for special analyses.

The cupolas are acid-lined, started with brick and patched by air-placed granular refractory. They have air-weight control and blast is supplied by either of two centrifugal fans capable of delivering 8700 cfm at 32 oz per sq in. pressure. Charges consist of: returns, 30 per cent; steel, 20 per cent; pig, 30 per cent; and scrap, 20 per cent. Metal weight is 1500 lb, coke splits weigh 250 lb, limestone weighs 50 lb per charge.

Cupolas are mechanically charged from a small-cone, side-discharge bucket carried on a skip hoist that can be pivoted to charge either cupola. At the bottom of its travel, the bucket is located under a hole in the ground floor adjacent to the coke and limestone bins. The stone discharges within easy shoveling distance while the coke discharges from a pan conveyor



Core blowers on second floor produce cores for light and intermediate gray iron castings.

Bronze foundry melting area with crucible furnaces in foreground, rotary furnaces in back.

directly through the hole into the charging bucket. Coke is kept in working bins, one on each side of the pan conveyor. These discharge through vibrating screens which remove everything under ½ in. and feed the pan conveyor. Supplementing the working coke bins are four concrete storage bins with a total capacity of 400 tons.

Metal is charged by the overhead crane operator who moves material out of adjacent concrete storage bins (total capacity 1200 tons) by electromagnet. He is guided by a huge scale dial located at cab level. The charger operator uses a smaller scale indicator which also registers weights on a tape to make a permanent record.

Molten metal comes out of the cupola and the electric furnace at 2850 F. Temperature is checked with an optical pyrometer every 15 min. Rapid check on metal out of the electric furnace is made by chill tests poured every 15 min. A spectrographic analysis of both cupola and electric furnace iron is made every 30 min. The spectrographic lab, located near the cupolas and electric furnace, is also used for analysis of stainless steels and copper-base alloys.

At the end of a heat, the bottom is dropped into a dump car and quenched by water jets attached to the legs of the cupola. The car is subsequently run outside and dumped.

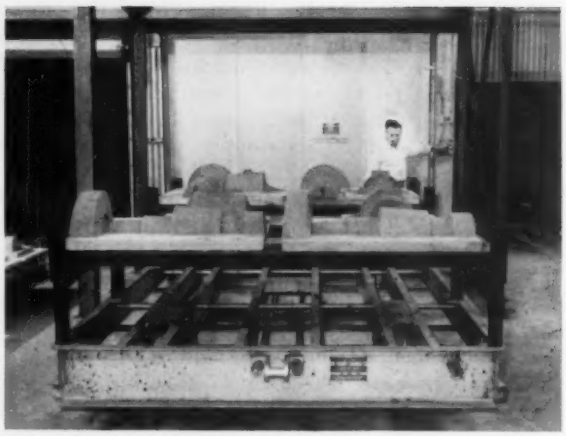
Use Continuous Blast Cleaning

Castings from the light and intermediate units travel about 2½ hr on the cooling conveyor before reaching the cleaning room. Intermediate castings are removed from the hooks by a hoist and transferred to the continuous monorail blast cleaning machine. On the way, they pass over a shake-out to remove excess sand and cores. As they pass through the blast cabinet, they are bombarded by shot from four wheels and are rotated, as the hooks turn on a vertical axis, to give complete shot coverage. The blast unit conveyor operates at 80 hooks an hour and cleans 15 tons of castings in that time. Grinding and chipping is done in a series of four booths serviced by jib cranes with electric hoists.

The light castings are sorted and sprued directly from the carriers of the cooling conveyor. Castings go into the skip hoist of a 14-cu ft airless-blast tumbling unit that cleans them at the rate of 5 tons an hour. Sprue goes into tote boxes and is returned to storage adjacent to the cupola charger by fork truck. After blast-tumbling, the castings are placed in tote boxes and moved by roller conveyor to the finishing area where they are touched up on four double-end stand grinders, and finished with air-driven hand grinders.

Both light and intermediate castings move north through the cleaning room on parallel lines of roller conveyors to the painting area. Following inspection, they are hung on chain conveyor hooks that take them through a water-curtain paint spray booth where a prime coat is applied.

Except for common source of molten metal, the heavy molding department might well be a foundry by itself. This department has its own shake-out and sand preparation facilities and its own cleaning equipment. Floor molding is done here at the rate of approximately 55 molds a day. Metal required is 15 to 20 tons daily. Molds are slinger-rammed on a stationary unit, controlled by the operator at the ramming head, near the east end of the floor and are moved west to the pouring area on floor-level roller conveyors or by crane. Three overhead cranes (one ten-ton cab-operated, two 5-ton floor-operated) bridge the floor and can be moved from core making at the east to cleaning at the west end.



Partial load of cores for heavy castings. Car-type ovens are located in No. 3 molding area.

Large cores are made, baked and finished at the extreme east end of the heavy castings department. Moving west, they are set in the molds which are subsequently poured from 1600-lb cylindrical ladles brought from the electric furnace by motor-operated monorail ladle carriers. The latter deposits the ladles for transfer to one of the overhead cranes for pouring.

After pouring and cooling, molds are transferred by crane to the shake-out. Shake-out sand is returned by inclined belt conveyor to a vibrating screen and thence to a 100-ton bin with discharge at floor level. An apron conveyor collects sand the length of the bin bottom and discharges it into the skip hoist of a high-speed muller. The muller discharges into a second skip hoist which supplies the plate feeder of the slinger.

After shake-out, castings are moved by overhead crane or fork truck to the cleaning and finishing area. This contains a swing-frame grinder, a compressed-air shot blast room, booths for grinding and chipping, and a preheat oven and welding booth, all served by jib cranes. The preheat oven is used not only for weld repair of castings, but also for stress relief of certain castings. A car-type oven, it is gas fired and operates at temperatures up to 1200 F.

The bronze and stainless steel foundries occupy an area 170 x 80 ft in the northeast corner of the building. Approximately one-tenth of the area is devoted to heat treatment and castings storage. The remainder is divided equally among: molding, shake-out, and sand conditioning; melting and metal storage; and cleaning and finishing.

Molding is done on four jolt-squeeze machines and a pair of rollover machines supplied with a natural sand from overhead hoppers. Finished molds are

Laboratory has complete facilities for chemical and spectrographic analysis and sand control.

North light of pattern shop is supplemented by batteries of fluorescent lights.

placed on knee-high roller conveyors at right angles to the line of molding machines. Molds are poured on the roller conveyors and pushed to the far end of the conveyor sections on to a transfer car which takes them to the shake-out adjacent to the sand conditioning equipment. Molds are dumped on a floor grating with an oscillating conveyor underneath to carry the sand to a bucket elevator. The line of roller conveyors and the shake-out area are served by two monorail bridges.

The bucket elevator carries the sand up to the third floor where it goes through a vibrating screen and into a 40-ton storage bin. The bin discharges by gravity into a high-speed muller capable of preparing 15 tons of sand per hour. Batches of conditioned sand are emptied into a hopper car that is elevated to the level of a monorail running above the molder's hoppers. The delivery hopper with clamshell bottom traverses the monorail and automatically stops over the desired hopper to release the sand, then returns for another batch.

Melting for copper-base alloys is done in two gas-fired, above-floor crucible furnaces, each able to handle up to 270 lb of metal per heat, and two gas-fired rotary furnaces of 1000-lb capacity. The rotaries are used for the larger heats and for melting borings and turnings from the machine shop. Two high frequency induction melting units for stainless steel have capacities of 1000 lb and 600 lb. Steel heat treating facilities are at the south end of the molding and melting area. Included are a gas-fired furnace (operates at 1600-2200 F) able to handle 1000 lb of castings, and quenching tanks.

Occupy New AFS Headquarters

The American Foundrymen's Society is in its new home.

While your AMERICAN FOUNDRYMAN was in the mail, the address of AFS Headquarters, as well as the editorial and advertising offices of "The Foundrymen's *Own* Magazine," changed from 616 S. Michigan Ave., Chicago 5, to Golf & Wolf Roads, Des Plaines, Ill.

Located on a roughly triangular plot of nearly two acres, the new AFS office building is adjacent to the Cumberland Station of the Chicago & Northwestern Railroad 26 miles northwest of the Chicago Loop. In addition to general offices, America's first foundry technical center includes a combined library and conference room, a stockroom, facilities for small print jobs, addressing, and mailing, and a lunchroom.

Plan for a permanent AFS headquarters building was first proposed at the 1950 AFS Convention by Walton L. Woody, National Malleable & Steel Casting Co., Cleveland, then vice-president of the Society. A Housing Committee with AFS Past President R. J. Teetor, Cadillac, Mich., as chairman was set up to determine type of building and general location.

A fund of over $225,000 for the 11,000-sq ft building was contributed by more than 1000 companies, individuals, and AFS chapters during a campaign conducted under a 16-man committee of foundry industry leaders. Ground was broken November 17, 1953.

The new AFS headquarters building will be dedicated November 18. Program details will be announced in the November issue.

Melting control starts with the raw materials used.

Malleable Melting Control

L. E. EMERY
Metallurgist
Marion Malleable Iron Co.
Marion, Ind.

Furnace atmosphere control and synthetic slags are highlights of this melting story told during the Malleable Round Table Luncheon at the 1954 AFS Convention and Exhibit.

■ For a number of years the art of melting was considered a mystery. Today the melting of metals has been placed on a scientific basis utilizing fundamentals rather than secret formulas and the personal touch of operators. The days are gone when a temperature measurement by eye or a glance at the color and character of a flame constituted the means of control. Instrumentation and control of individual phases of the melting operation are becoming more essential with the increasing demand for higher quality.

Since many variables in the foundry are impossible to control on a practical basis, it is important to take all the steps possible to control the base product—the metal. At Marion, the policy is to keep the operation simple and to control as many variables of the primary melting units as possible. The use of melting controls is a preventive method set up to eliminate the variations in melting practice, and can be only as good as the policing of the standard procedures which are set up.

The metallurgical laboratory is the starting point for control procedure, which begins with the establishment of specifications for incoming raw materials. Melting coal, coke, steel scrap, and pig iron are checked before the material is unloaded. Raw materials which do not conform to specification are rejected. This is extremely important in avoiding metallurgical problems, and in maintaining normal melting and metal costs.

It is possible to use materials which do not fall within the specification. However, this requires alterations—usually costly—in the standard practice. To illustrate the effect of materials not up to specification, take the company's experience with melting coal. Coal *A* (30-32 per cent volatile, 5 per cent ash) required 240 to 250 lb per ton of iron melted. When using coal *B* (22 per cent volatile, 3.5 per cent ash), 175 lb per ton were required for super-heating. By using the longer-flame coal *B*, it is possible to equalize the flame temperature between the front and back of the furnace.

Routine checking of incoming melting materials has proved to be an invaluable step in controlling the process, whether it be duplexed or direct fired melting. Specifications on raw materials are not chemical alone. Steel scrap, melting coal, and coke, must be within the specified size range.

Construction and Repair Critical

Construction and repair of the individual melting units is another critical phase of melting control. Uniform day-to-day construction of the cupola includes the ramming of the sand bottom, repair of the well, metal dam height, repair of the breast and tap hole, tuyere openings, and, finally, proper replacement of the lining in the melting zone. Each of these points should be carefully checked each day, not only from a metallurgical standpoint, but also from a production point of view. The height of the metal dam, and size of

the tap hole will have a very decided effect upon the carbon content of the iron. Likewise, the height of the sand bottom will have an effect upon carbon content and result in erratic cupola operation.

Until a template was used to standardize ramming of the cupola bottom, carbon content of cupola iron would be 3.00 per cent one day and 2.70 the next. In addition, slag backed up into the tuyeres when the bottom was too thick. Standard practice eliminated both difficulties.

In the author's practice, the amount of burn-out is checked each day by means of an adjustable gauge. After the lining has been replaced in the melting zone by means of a pneumatic gun, the cupola mason measures the lining to insure a constant melting zone each day. The moisture content of the lining is checked each day, and a record of rebound is kept on each heat.

Moisture is determined on a representative sample of lining material after the lining has been placed. Aim is to hold to 9-11 per cent moisture. Above 14 per cent, the lining spalls and slides. Rebound of air-placed refractory is caught on a canvas and bagged. Normal rebound is 300 lb for 3000 lb applied. If rebound exceeds 10 per cent, the material being used is checked immediately.

The tap hole, breast, and metal dam are also checked each day, and made to conform to the standard. Since the metal is made in the cupola, it is very important to control the basic tool in the melting department.

Maintain Constant Burner Angle

Constant burner angle and opening over the bridge wall should be maintained since these two factors have a decided effect on combustion efficiency, refractory performance, and carbon control. Burner angle is checked with a protractor, chalk line, and level. The chalk line is placed in the burner on the inside of the furnace and lined up to the side wall.

The angle at which the burner is set depends upon the type of coal used (long or short flame) and type of melting (direct or duplex). Furnace dimensions inside also determine the position of the burner. Marion Malleable air furnace dimensions and burner angle are shown on the furnace chart (see figure).

The opening over the bridge wall has considerable influence over carbon control, heat distribution, combustion efficiency, and refractory life. Generally, operators will use a choke on the bridge wall, but ideally waste products of combustion should encounter minimum resistance as they leave the hearth. If the bridge wall opening is increased, flame temperature drops and carbon reduction falls off. To insure a constant opening, fly ash is thoroughly cleaned off and the bung above is kept up. As the bridge begins to burn away, the bung is lowered to maintain a constant height

Table 1. . Coke Changes to Compensate for Humidity

Humidity, Grains per cu ft	Change Coke Split	Pounds Change in Coke Split For Weight of Metal Shown			
		1 ton	1¼ ton	1½ ton	2 ton
1	Take Off	12	15	18	24
2	" "	8	10	12	16
3	" "	4	5	6	8
4	Control Point	..	..	..	..
5	Add	4	5	6	8
6	"	8	10	12	16
7	"	12	15	18	24
8	"	16	20	24	32
9	"	20	25	30	40
10	"	24	30	36	48

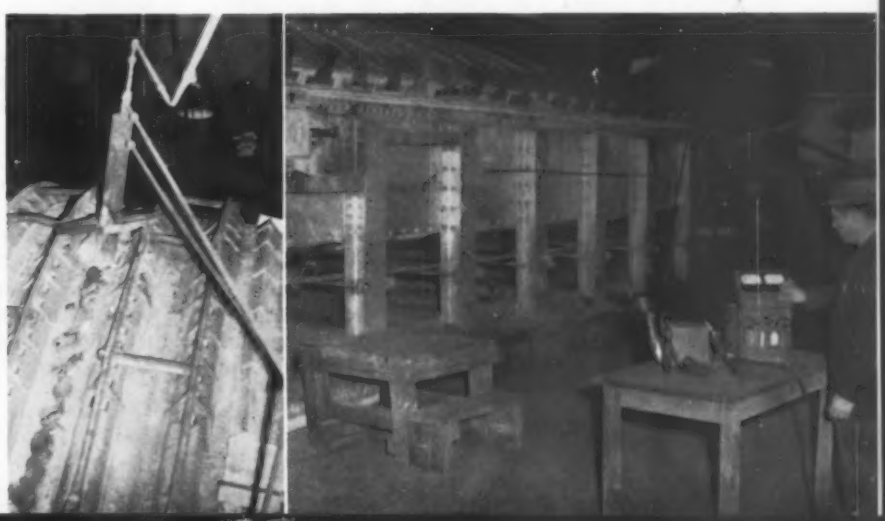
58.5 grains per pound = 4.0 grains per cubic foot

Table 2. . Effect of Composition on Slag Color

Color of Slag	FeO	SiO_2	CaO	MnO	CaO/SiO_2 Ratio
Very Black	5.17	46.84	29.16	5.51	0.622
Black	4.45	45.90	28.09	3.95	0.602
Black to Dark Green	4.21	47.30	28.75	3.92	0.610
Dark Green	3.28	48.02	30.04	4.78	0.625
Green	2.66	46.48	31.76	4.13	0.684
Light Green	1.61	50.38	30.20	3.90	0.60

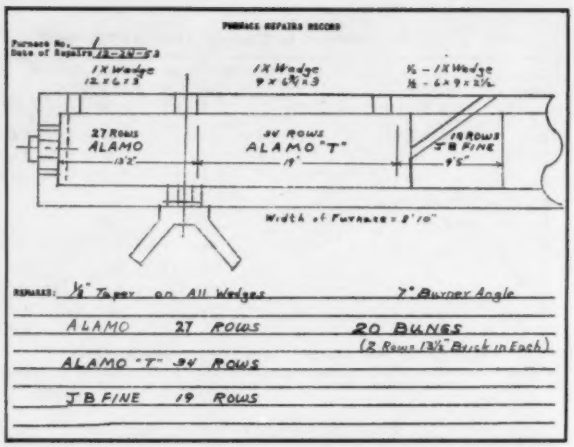
Table 3. . Air Furnace Operating Conditions

Time	Ports	Excess Oxygen	Combustibles, per cent	Temp., deg. F Front Wall	Back Wall
Preheating Period					
11:00 pm	Open	0	3.0	3150	2680
12:00 pm	Closed	0	5.0	3130	2700
Superheating Period					
4:00 am	Open	0	0.2	3195	2900
7:00 am	Open	0	0.15	3200	2910
Holding Period					
12:00 noon	Open	0	3.0	3120	2880
1:30 pm	Open	0	1.5	3025	2820
3:00 pm	Open	0	1.0	3020	2780



Water-cooled sampling tube is located just over bridge wall. Upper tube collects gas sample. Lower lines carry cooling water.

Quick analysis of combustion gases for excess oxygen or combustibles is made with heat prover.



FURNACE REPAIRS RECORD

Furnace No. 1
Date of Repairs 12-10-52

1X Wedge 12 x 6 x 3 | 1X Wedge 9 x 6¾ x 3 | ½ – 1X Wedge ½ – 6 x 9 x 2½

27 ROWS ALAMO 13'2" | 34 ROWS ALAMO "T" 11' | 19 ROWS JB FINE 9'5"

Width of Furnace = 2'10"

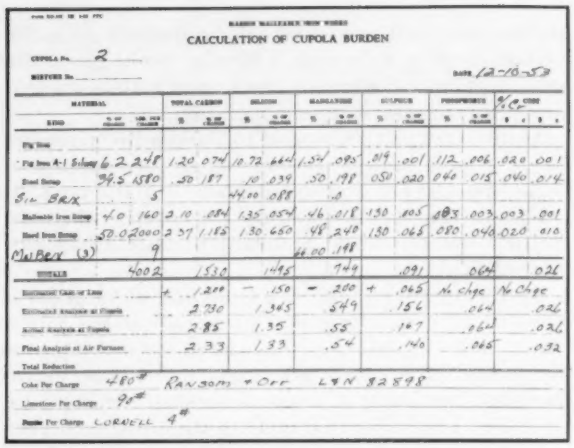
REMARKS: ½" Taper on All Wedges — 7° Burner Angle

ALAMO 27 ROWS — 20 BUNGS (2 Rows 13½" Brick in Each)

ALAMO "T" 34 ROWS

JB FINE 19 ROWS

Furnace repair sheet gives continuous record of refractory cosumption and furnace maintenance.



CALCULATION OF CUPOLA BURDEN

CUPOLA No. 2
HISTORY No.
DATE 12-10-52

MATERIAL	TOTAL CARBON		SILICON		MANGANESE		SULPHUR		PHOSPHORUS		% OF COKE	
KIND	% OF ANALYSIS	LBS. PER CHARGE	%	% OF CHARGE	%	% OF CHARGE	%	% OF CHARGE	%	% OF CHARGE	%	%
Pig Iron												
Pig Iron A-1 Silvery	6.2	248	1.20	.074	1.72	.664	1.54	.095	.019	.001	112	.006	.020	.001
Steel Scrap	39.5	1580	.50	.197	.10	.039	.50	.198	.050	.020	.040	.015	.040	.014
Silv. Brix		5			4.00	.088		.0						
Malleable Iron Scrap	4.0	160	2.10	.084	1.35	.054	.46	.018	.130	.005	.083	.003	.003	.001
Steel Iron Scrap	50.0	2000	2.27	1.135	1.30	.650	.48	.240	.130	.065	.080	.040	.020	.010
Mn Brix (3)		9					44.00	.198						
TOTALS		4002		1530		1495		749		.091		.064		.025
Estimated Gain or Loss			+	.1200	−	.150	−	.200	+	.065		¼ Chge		¼ Chge
Estimated Analysis at Tuyeres				2.730		1.345		.549		.156		.064		.026
Actual Analysis at Tuyeres				2.85		1.35		.55		.167		.060		.026
Final Analysis at Air Furnace				2.33		1.33		.54		.140		.066		.032
Total Reduction														

Coke Per Charge 480# RANSOM + Orr L4N 82898
Limestone Per Charge 90#
Resin Per Charge CORNELL 4#

Cupola burden calculations are carefully made and recorded as part of melting control procedure.

between the bridge wall and the center of the bung arch.

When the furnace is being repaired, it would always be rebuilt to its rated capacity. If the capacity of the furnace is increased or decreased by 20 per cent of its rated capacity, control of composition and properties as well as refractory costs becomes exceedingly difficult. This is overlooked many times in order to increase production, or, in some cases, to reduce large furnaces to conform to reduced tonnage. This is not a good practice, and it is much better to operate within the 20 per cent plus or minus range.

Furnace Chart Is Kept

A furnace chart is kept on each repair to show the quantity of refractory, brand, etc.; any changes made are shown on the diagram. It has been found advantageous to deviate from the usual air furnace construction. The hot zone of the bottom is constructed with 12 x 6 x 3-in. 1-X wedges. The 1-X wedge makes a perfect inverted arch and the 3-in. brick reduces the number of joints. The balance of the bottom is laid with 9 x 6¾ x 3-in. 1-X wedges. Here, again, the 1-X wedge and 3-in. brick is used to reduce joints and to obtain better joints. A feather edge brick is laid at the interface of the vertical wall and the bottom.

Next order of control is preparation of the bed and charging. The bed coke is weighed before it is put into the cupola and is ignited with a gas torch. The bed is burned in with natural draft and given a 3-min blow prior to charging. The charging is done with a 10-ton magnet which can be seen from the cab of the crane. A charge card shows the order of charging and the amount of each ingredient. Calculation of the mixture is recorded on a form showing the percentage of each element going into the cupola, estimated gain or loss of each element, and actual gain or loss for each. The brand of coke, and car number, are listed on each mix sheet to correspond to the analysis of the car.

A sample poured from the cupola every hour is checked for carbon, silicon, manganese, and sulphur, as a guide in controlling cupola operation. A preliminary furnace analysis is taken 1½ hr after the cupola has been tapped and samples are taken every 30 min thereafter to control the chemistry of the iron as it is being melted and superheated. A mottling pin, 7 in. long and 2 in. in diameter, is poured every 30 min to check for primary graphite, and any sudden changes in carbon or silicon loss. This pin is poured in a core and permitted to cool in the core for 5 min, 3 min on the floor, then quenched in water.

In addition, a fluidity spiral, two molds of tension test specimens, and two molds of square bars are poured each hour. The square bars are 7 in. long and ⅞-in. square. These bars are permitted to cool in the mold. One set is broken and checked for primary graphite, and the other set put into the annealing pots to check annealability.

Cupola temperatures are read at the spout with an optical pyrometer every 30 min, and a check of pressure and slag color is made simultaneously. Once per hour, grains of moisture per cubic foot of air is measured, and coke additions made accordingly.

Table 1 serves as an excellent guide in controlling oxidation in the cupola, particularly in humid weather. This tool enables the operator to anticipate the necessity for adding coke to the splits to prevent excessive oxidation and drop in bed height. It also is an invaluable aid when the cupola is started in the morning, giving the operator advance information to adjust the coke split should the humidity be abormal.

Slag control is one of the oldest methods of controlling bed height and anticipating changes in the condition of the bed. To identify the changes in chemical composition which can be recognized by varying changes in slag color, Table 2 can be used as a guide.

The FeO content is dependent upon temperature and CaO content of the slag. These slags are basically glass, and differ only in color and degree of porosity. There is no structural detail except for variation in size and distribution of included gas pores. Checking the temperature of the cupola when evaluating the color of the slag is important. Usually, when the metal temperature of the cupola begins to drop, the slag begins to turn dark in color. This indicates oxidation

Optical pyrometer is used to check metal temperature of air furnace iron. Range is 2890 to 2910 F.

in the cupola. Such slags almost always show a higher FeO content.

Sometimes the operator can be misled by a change in slag color, particularly if a large quantity of rusty scrap and foundry pig is used in the change. Additions of deoxidizer will also change the color of the slag and must be considered when establishing a slag control program. When silicon carbide, or a deoxidizer of this type, is used, the slag will usually run much lighter in color and have a lower FeO content.

Relatively New Practice

Slag control in air furnace operation is a relatively new practice. The author has used synthetic slags for holding the carbon in the air furnace after the cupola bottom has been dropped. Various types of slag have been tried, including cupola slag. Experience shows that a synthetic slag comparable in composition to the furnace refractories gives the most satisfactory results. At Marion, the most common slag mix used consists of:

Graphite (40 mesh)	150 lb
Grog, pea size, 40 per cent alumina	425 lb
Lime	50 lb
Silica Sand	175 lb

Grinding grog was discontinued due to high cost and it is now purchased from the company that supplies brick for the furnace linings.

This slag shows the least amount of attack on refractories, has good insulating properties, and is not difficult to skim from the bath. It protects the metal from oxidation during holding periods and makes possible closer control of the chemistry of the furnace bath.

Proper Control Is Essential

Proper control over furnace atmosphere, as well as slag composition, is essential to good furnace performance. The preheat on a furnace which has been relined is very important since the performance of the refractories can be jeopardized by improper heating. The atmosphere during the initial preheat has much to do with the chemistry of the iron and with ultimate refractory life.

To exercise extremely close control over furnace

Heat No. 589 — DAILY CHARGE CARD — Date 12-24-53

MARION MALLEABLE IRON WORKS

Cupola No. 2 Bed Height 64" Bed Stone 300 lb. Bed Flux 8 lb.

MATERIAL	WT.	EXTENSIONS	TOTALS
PIG IRON			
PIG IRON J-20	268	268	
STEEL Rails	200	468	
Shells	600	1068	
Plate	600	1668	
SPRUE	2160	3828	
MALLEABLE SCRAP	160	3988	
FERRO-CARBO			
MN BRIQUETS (3)	9	4000	
SI BRIQUETS			
HARD IRON PIGS AND SPILLS			
CHARGE TOTAL	4000		
COKE SPLIT	380		
COKE BOOSTERS			
BED COKE			
LIMESTONE	90		
CORNELL	4		
FLUORSPAR			
FURNACE ADDITIONS			
GRAPHITE No. 8			
FERRO-MANGANESE			
PIG IRON			
SODA ASH			
TOTAL MELT			
PIGGED IRON			

Daily charge card shows details of charges and bed.

DAILY MELTING REPORT

Heat # 18 On Bottom — MARION MALLEABLE IRON WORK — Date 3-15-54

Cupola No. 2 Furnace No. 1 Heat No. 647 Tons Charged 110 Scrap Loss 12.0%

CUPOLA DATA — AIR FURNACE — PRELOCATING DATA

Blast 4#

Ave. — 2.93 1.32 .59 .14 .065 .032 2910

Melting report covers daily operations of cupola and air furnace, gives record of time, dimensions, analysis.

Port holes for secondary air are closed off by sliding door or by using portions of firebrick.

atmosphere, a "heat prover" is used. This instrument indicates the amount of excess oxygen or combustibles present in the furnace. From these readings the air and coal ratios are adjusted to give the proper atmosphere in the furnace. During the refining (superheating) period and the holding periods, the atmosphere must be adjusted to obtain the desired results.

Typical readings and operating data during various stages of operation are shown in Table 3. The portholes were open most of this particular day. The use of the ports for secondary air is dependent upon atmospheric conditions and the grindability of the coal. Some days, the ports are closed 50 per cent of the day, and others, 75 per cent. When the ports are open, the flame is held away from the wall and there is less damage to the refractories. The use of secondary air at the burner also makes it possible to distribute the flame temperature, resulting in a better balance between the front and back of the furnace.

The heat prover has been extremely effective in reducing fuel costs and in eliminating the human element in firing technique. The resulting proper combustion improves physical properties and eliminates many metallurgical problems.

Superheating of the air furnace is of considerable importance at Marion and flame temperatures are taken with an optical pyrometer and recorded regularly. These readings are used in conjunction with heat prover data; reliance is no longer placed on a glance at the color and character of the flame. Primary considerations are fuel-air ratios and temperature, and these can be controlled. To reduce refractory losses temperature is taken at the beginning of the light off, and every 30 min. thereafter. A reducing flame is used during the heating period. Two 9 x 6¾ x 3-in. ports in the front wall of the furnace provide secondary air, which has proved valuable during the preheating.

The heat prover, a useful tool in both duplexing and direct furnace melting, is simple to operate. A portable instrument, it provides an accurate measurement of oxygen and combustible gases. The oxygen analysis is a direct measure of excess air, and the combustible gases analysis is a direct measurement of unburned gases, the result of incomplete combustion. Two meters mounted on the instrument give rapid and continuous analyses by volume within two ranges, 0-4 per cent and 0-20 per cent.

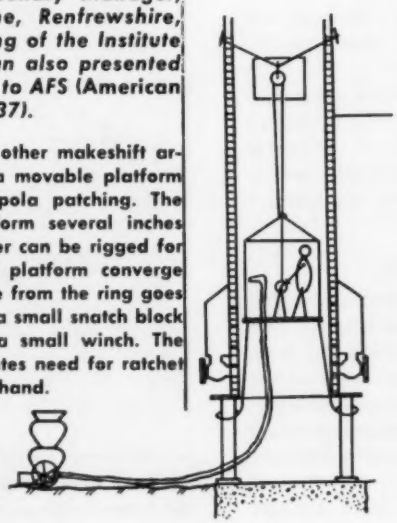
Accuracy of the instrument is within plus or minus 2½ per cent of the full scale as long as the sample is in excess of 12 per cent combustibles or 12 per cent oxygen. A small amount of methane (not in excess of one per cent) may be found in the sample and will add to the combustible reading.

Now, There's an Idea!

Excerpted from "Cupola Practice: Second Thoughts", presented by W. Y. Buchanan, foundry manager, John Lang & Sons, Ltd., Johnstone, Renfrewshire, Scotland, at the 1954 annual meeting of the Institute of British Foundrymen. Mr. Buchanan also presented this year's exchange paper from IBF to AFS (American Foundryman, May 1954, pp. 127-137).

Planks, short ladders, oil drums, and other makeshift arrangements can be done away with if a movable platform is used in pneumatic placement of cupola patching. The illustrations show how a circular platform several inches smaller than the smallest cupola diameter can be rigged for the cupola man. Four chains from the platform converge above spreaders to a single ring. A cable from the ring goes over the top pulley, back down through a small snatch block at the ring, and around the drum of a small winch. The winch is driven by a worm gear (eliminates need for ratchet or brake) and can be cranked with one hand.

When the operator stands at the edge, the platform may tilt appreciably. This is overcome by running four light ropes from the platform to the legs of the cupola.



D. Dixon

South Croydon, England

How Slag Attacks Refractories

■ "If we were to record the life history of the enormous numbers of refractory bricks that are made every year, we should probably find that the majority meet their end through attack by molten slags, glass or metal."

J. F. Clements expressed a truism apparent to foundrymen when he wrote these words for a symposium on ceramics published recently by the British Ceramic Society.

"Refractory" is defined as "difficult to melt," but the melting point of a refractory is not a reliable measure of resistance to solution and erosion by slags, metals, and furnace gases.

There are many kinds of refractories but the most generally known are fireclay, sillimanite, mullite, alumina, fused alumina, silica, siliceous, chrome, magnesite, dolomite, silicon carbide and zircon. The foundryman's choice is usually limited, however. He has to compare length of service under rough conditions with initial cost. He often regards crucibles as special tools and does not include them in his conception of refractories. In covering his requirements in intermittent furnaces melting for casting, he therefore thinks chiefly of fireclay and aluminous fireclay refractories with silica and siliceous refractories to a lesser extent.

Refractory Melting Points

The melting points of the best-known refractories are: fireclays, 1550-1750 C; mullite, 1810 C; pure alumina, 2050 C; silica, 1710 C; siliceous, 1550-1600 C. These temperatures thus fall within the description of dazzling white heat.

The above figures are obtained by simple laboratory tests to determine the maximum temperature which a refractory will withstand melting. The more elaborate test of refractories-under-load indicates the temperature at which deformation or subsidence occurs with a specified load and a specified rate of increase of temperature. Other tests are the chemical analysis, spectrum analysis, and differential thermal analysis to indicate in greater or lesser detail the percentage of

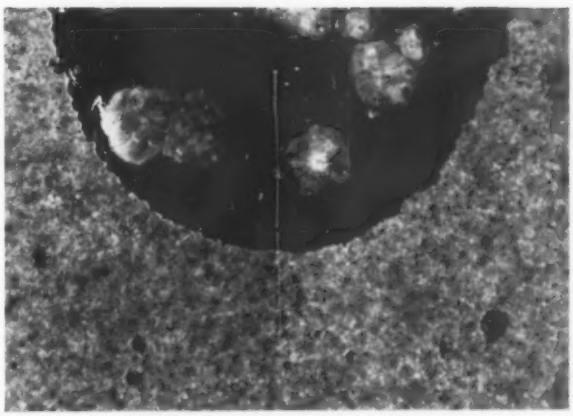


Fig. 1. . Slag test shows attack of blast furnace slag on fireclay brick. White areas in the dark slag contain crystals of anorthite, $CaO \cdot Al_2O_3 \cdot 2SiO_2$.

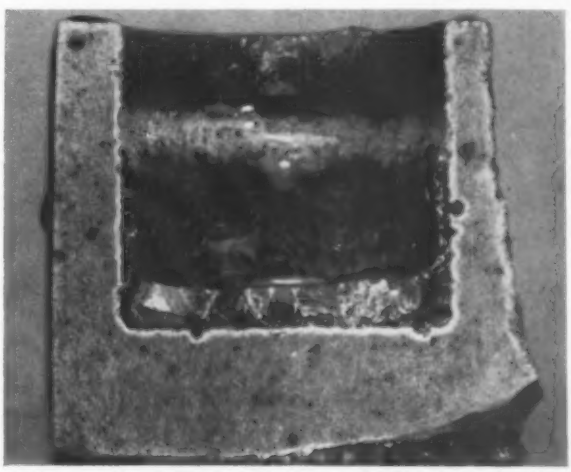


Fig. 2. . Crucible-shaped test piece of refractory with white mullite layer at interface of slag and brick. Any foundryman can make test.

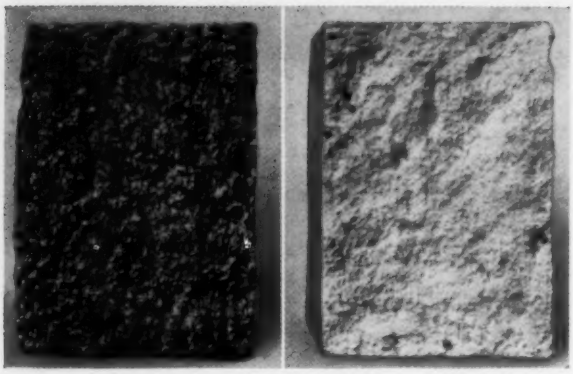


Fig. 3. . Examples of fireclay bricks show texture contrast between coarse grog (left) and fine grog.

alumina, silica, and other constituents, including those regarded as troublesome impurities. After-expansion or after-contraction on heating to specified temperature are determined.

There is also a test to indicate the reversible thermal expansion on heating, and the risk of thermal spalling. Other tests determine the porosity and permeability arising from the volume and type of pore spaces in the refractory. There are tests for cold crushing strength, the cross-bending strength or modulus of rupture, the density, and the thermal conductivity.

The foundryman, however, will ask: What are the tests to determine those characteristics of refractories which insure good resistance to the solvent and erosive effects of slags, metals, and flux-laden furnace gases? The effects are grouped by many people in the term "slag attack." Several tests indicate the resistance of a refractory brick to it. A brick can be immersed and rotated in a bath of molten slag or metal, the surface of a brick can be heated by a flame carrying slag particles, or a stream of slag particles can be directed on to a heated surface. These tests do not imitate furnace conditions, however. They serve rather as comparative tests for a range of samples to indicate which is the most resistant.

Simplest Test

Perhaps the simplest and most informative test is the heating to furnace temperature of a small heap of slag on the surface of a refractory brick. The brick may subsequently be cut in half to show the depth of penetration and the extent of solution (Fig. 1).

Provided that the furnace temperature and atmosphere are not much different from that of the test, the result of the test will help choose from a range of sample bricks. The effect of flow of a slag coating will not be shown, however, and this is an important point.

F. H. Norton, in his book *Refractories*, states that slag action can be divided into chemical effects and physical effects. The material produced by the reaction of the slag with the refractory brick usually melts at a temperature lower than that maintained in the furnace. If equilibrium conditions produce no material melting at a lower temperature than that at which the refractory is maintained, there will be no serious slag action. If the reaction material is formed rapidly, however, and melts at a lower temperature than that maintained in the furnace, so that it flows rapidly over the face of the refractory, the slag resistance of the refractory will be poor. The flow may be streamlined or turbulent.

Norton also discusses the effect of diffusion of substances through the molten slag and its effect in bringing reacting substances together. The "wettability" of the surface of the refractory and the extent of penetration of the texture influence solution and erosion. This description by Norton indicates the difficulty of correlating conditions for tests with conditions in the furnaces.

Whether refractory bricks are inert to slag attack therefore depends chiefly upon the analysis, the permeability, and the kilning temperature. The last factor indicates whether physical and chemical changes have been completed sufficiently by kilning to stabilize the refractory for foundry furnace temperatures.

Coating of Slag May Be Protective

A thick viscous coating of slag on a refractory brick may be protective rather than erosive. If the slag is sufficiently viscous, there is not the streamlined or turbulent flow to cause solution and erosion of the firebrick. A viscous slag coating may be deposited by flux-laden furnace gases. The coating reacts but slightly with the firebrick surface so that it adheres without forming, by penetration and solution, a visible bricklayer or interface. The coating may stay as a protection for a long time, provided that intermittent furnace operation with consequent heating and cooling of the slag coating does not cause changes in the volume of the slag different from that of the firebrick so the coating spalls, bringing away a film of firebrick.

Slag Coating Is More Fluid

Figure 2 illustrates the "white line" formation behind a less viscous slag coating. The slag coating in this case is more fluid because of high furnace temperature or a high content of slag constituents, such as iron, lime, and alkalis, which react to form compounds of low melting point. Some of the silica in the fireclay brick has dissolved or diffused into the slag coating. The remaining silica with the alumina in the fireclay has crystallized into mullite, which shows as the white line. This mullite is in the form of interlocking needle-like crystals and has an alumina content of approximately 72 per cent, the balance being silica with some impurities.

When this development of a mullite brick-slag interface is secured on the refractory furnace lining, the solvent and erosive effect of the slag is slowed for the mullite layer will be more resistant than the original refractory brick to the glassy slag coating flowing over it. As it is slowly dissolved, the alumina in the mullite will render the slag coating more viscous and less erosive.

High alumina refractories should be more resistant to slag attack, therefore, than average fireclay bricks provided that they have been made with low permeability to minimize penetration by fluid slag. Many high alumina refractories, however, have high porosity and high permeability. One reason may be the changes

during kilning in the kyanite, sillimanite, or andalusite which is used as a grog with plastic fireclay in mixings for high alumina refractories.

The formation of mullite crystals is accompanied by an increase in volume of kyanite. If this volume increase is not closely related to the shrinkage of the bonding clay, density and flow permeability may not be secured.

The manufacture of aluminous refractories of high mullite content, hard, dense, and of low permeability requires a careful selection of grogs and bonding with appropriate de-airing, pressing, drying, and kilning. This is costly and requires a selling price substantially higher than that of refractories made simply from native clays and grogs.

In a paper presented in 1952 to members of the British Institute of Vitreous Enamellers, R. J. Slawson and J. F. Clements stated that hard firing of aluminous refractories increases their resistance to corrosion and erosion. They added that the effect of the texture of the refractory complicates the assessment of constituents such as alumina. (Fig. 3).

Bricks Are Resistant to Corrosion

It is claimed that fire bricks containing about 20 per cent alumina and "sillimanite" refractories with about 60 per cent alumina are resistant to corrosion, but refractories with intermediate contents of 30 per cent to 40 per cent alumina are prone to attack. These intermediate compositions are often more porous than the others and this is probably the reason for these curious results.

It is probably true that, with two materials of similar texture and porosity, the one with higher alumina content will be more resistant to attack. Similarly, if the alumina contents are equal, the brick with the finer texture and lower porosity will have the advantage. They add that the special materials, sillimanite or zircon, should not be treated merely as substitutes for fireclay grog, but bricks containing them should be fired as high as possible.

Dissociates During Kilning

Fireclay dissociates during kilning at quite a low temperature. According to Dr. J. H. Chesters, in his contribution to *Ceramics*, the alumina in the fireclay brick, after dissociation, crystallizes at about 900 C, and it begins to react with silica to form mullite crystals at about 1100 C. Thus, the extent of mullite formation and the amount of silica in the form of glass or cristobalite depends upon the percentage of alumina in the mixture and the nature of the materials.

J. F. Clements states that hard firing is often of more value to a refractory than refractoriness itself, so far as slag attack is concerned. Norton and Clews explain that there is always some mullite in aluminous refractories. A reliable description of the physical and chemical characteristics of a refractory and the methods of securing them is much more important, therefore, than the refractoriness test to a discriminating user who needs high resistance to slag attack.

Figure 5 shows a number of used fireclay bricks from a cupola producing high quality iron. The slag has penetrated the texture of the brick and dissolved the matrix so that the grog particles are being carried

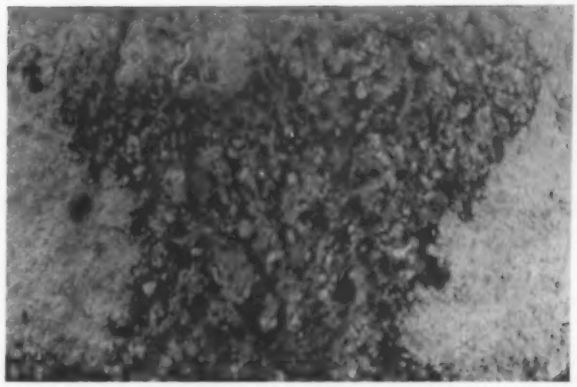


Fig. 4. . Test piece of refractory material with grog washed out due to flow of molten slag.

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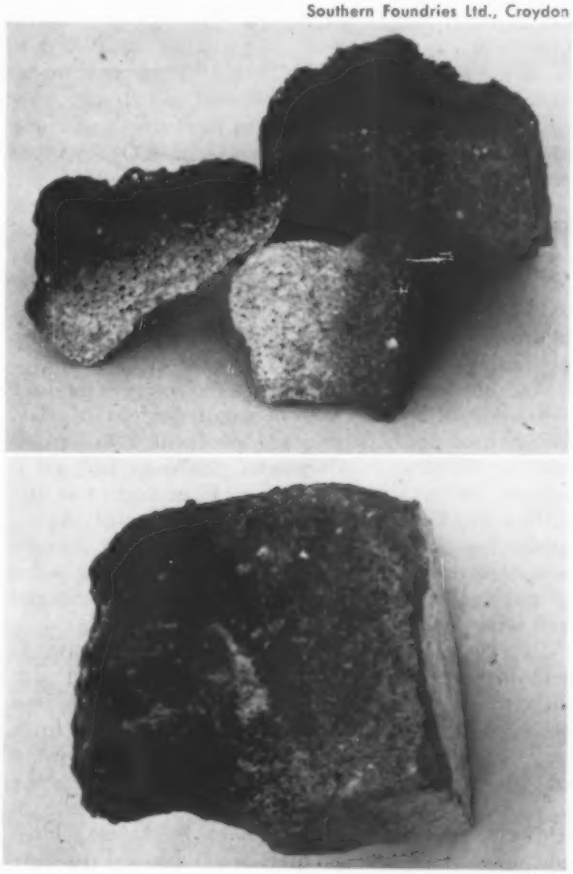

Fig. 5. . Fragments of fireclay brick from cupola. Upper: penetration, solution of bond, removal of grog; lower: semi-vitrification in high-temperature zone.

away in the flowing slag. When slag is fluid in furnaces operating at medium temperatures and the formation of a mullite brick-slag interface is too slow, so that penetration of texture is the cause of erosion, a siliceous brick may be more economical than an aluminous brick.

The siliceous or semi-silica brick sometimes used for medium temperatures will contain from 80 to 90

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Fig. 6. . Used fireclay brick from upper part of cupola shows how reducing gases have darkened and weakened the texture. Compare Fig. 5.

per cent silica, the balance being clay. A siliceous hide which is glassy and hard may be developed to resist the medium temperature slag attack. It is useful to remember the well-known Bowen and Greig graph, which gives the melting point of the eutectic of alumina-silica compounds (94.5 per cent SiO_2, 5.5 per cent Al_2O_3) as 1595 C.

The melting points of other eutectics were given by Dr. J. H. Partridge in a lecture to the Royal Society of Arts in 1938 as: 36 per cent lime (CaO)—64 per cent silica (SiO_2), 1438 C; and 62 per cent iron oxide (FeO)—38 per cent silica (SiO_2), 1180 C. These figures explain why the viscosity of slag coatings varies so greatly according to composition.

Another form of semi-siliceous refractory is ganister —ground silica rock with a small content of clay. When used for patching eroded furnace linings, it may be better than aluminous patchings because it adheres better without crazing. It protects the firebrick lining from solution and erosion by satisfying the initial hunger of the attacking slag. If the furnace temperature reaches the relatively low melting point of the semi-siliceous material, however, the material will soften and flow.

Experience with linings of ladles which have to contain molten steel is significant in connection with the resistance of siliceous fireclay brick and aluminous fireclay brick. The low alumina type of fireclay brick may be preferred to the high alumina because it swells and glazes rather than contracts and crazes in service to insure tight joints and a monolithic surface to withstand the molten metal. Such bricks may bloat and melt, however, if they are subjected to temperatures over 1400 C for any length of time.

Thus, for cupola linings the most economical refractories may be dense, hard, fireclay bricks with alumina content as high as possible, consistent with low permeability and absence of after-contraction in service. A hard-setting aluminous cement of high melting point should give resistant joints and be useful also as a surface wash on the face of brickwork to check initial slag penetration. Ganister is better than aluminous patchings for lining repairs.

It is sometimes said that refractories have "burned away." Refractories do not burn, however, unless they contain carbon and the conditions in the furnace are strongly oxidizing. Under the latter conditions, particularly at temperatures of the order of 900 C, bricks made of carbon and the carbon in plumbago or silicon carbide crucibles may burn. Other refractories are consumed by penetration, solution, corrosion, erosion, abrasion, spalling, or a combination of the processes.

Though the fireclay and other alumino-silicate refractories cannot be burned under oxidizing conditions and usually they withstand the temperature changes in intermittent furnaces without spalling, they may be adversely affected by strongly reducing conditions. A reducing atmosphere in a furnace may render the slag more fluid and erosive. Carbon may be deposited in the texture of a fireclay brick by reason of the catalytic effect on carbon monoxide of the iron present in the fireclay as an impurity. Figure 6 shows how a reducing condition has darkened and weakened the texture of a used fireclay brick so that it is less resistant to slag attack.

If the iron is combined as an iron silicate, however, by adequate kilning of the firebrick, it will not cause carbon deposition. A fireclay brick required to resist reducing conditions should therefore be low in iron content and well-kilned.

The spalling which is complementary to slag attack as a cause of consumption of refractories may take one or more of three forms. It may be thermal spalling because of sharp temperature change or gradient. Rapid heating tends to cause expansion of the hot face of refractory so that it may flake. Rapid cooling puts the hot face in tension so that there is a tendency to crack at right angles to the hot face. The spalling may be physical because of the flaking of a fused refractory surface. It may be structural because of strains or pinching arising from movement of the furnace structure.

This 128-year old pipe bend was part of cast iron soil pipe system found in perfect operating condition during recent renovation of Independence Hall, Philadelphia. Its discoverer, William Sheppard (right), presents it to his son, William Sheppard, Jr. (center), and Edward Suez, Jr., plumbing students, for display at Bok School.

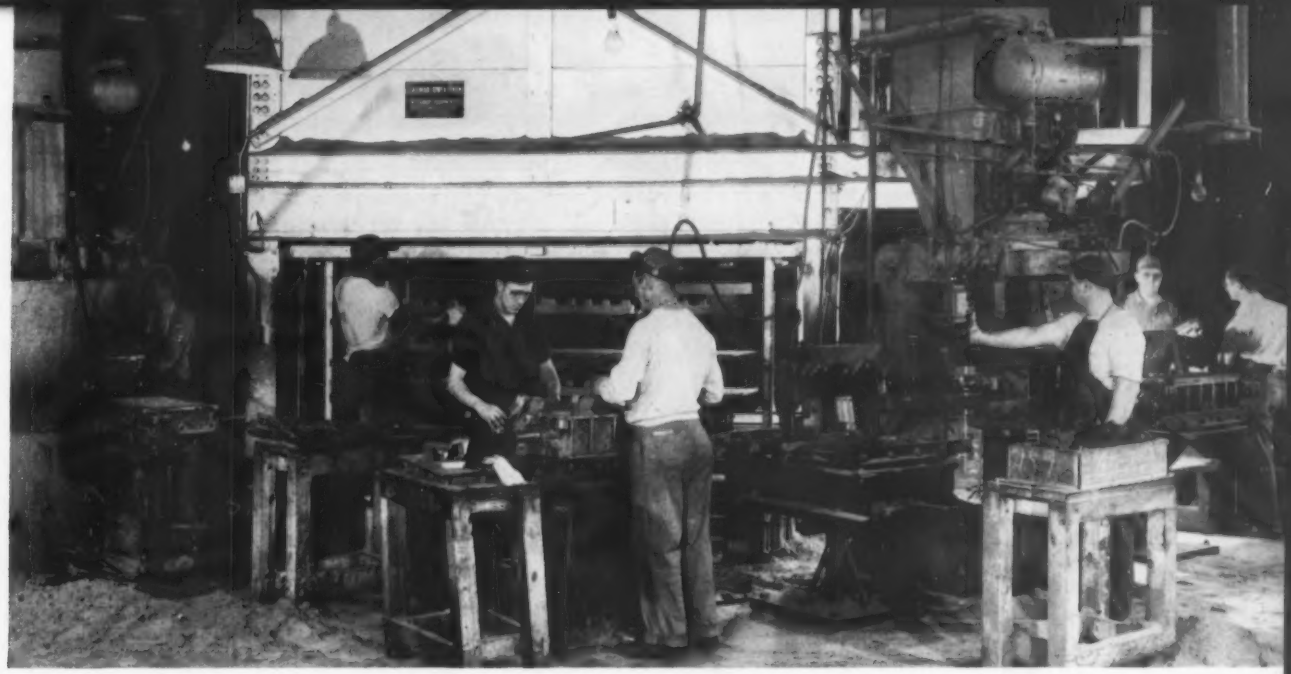


Fig. 1 . . Every 10 minutes this core making station uses approximately 1200 lb of prepared sand.

Conveying Core Sand

JOHN H. KAUFFMAN / *Foundry Engineer, Studebaker Corp., South Bend., Ind.*

The best features of batch handling and pneumatic conveying equipment can be realized by combining the two methods according to this paper presented at the Metal Casting Conference, Purdue University.

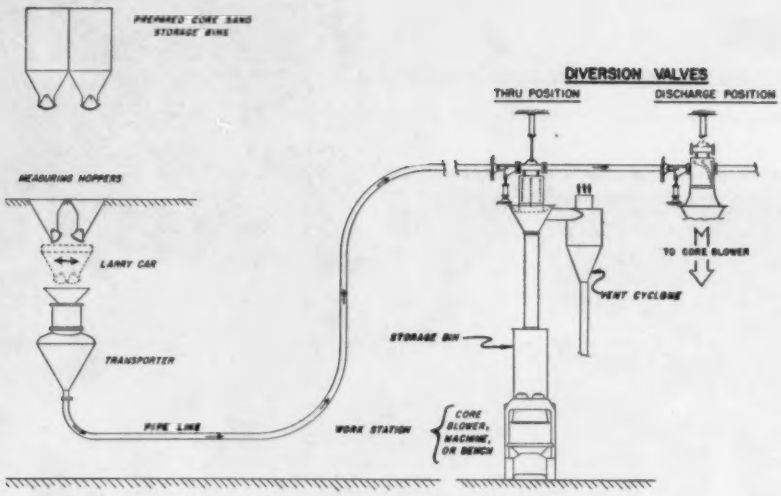
■ Pneumatic conveying of bulk raw materials of a dry pulverized or granulated nature such as cement, ashes, powdered coal and grain with low pressure or vacuum systems has been common for many years. Recently foundries have become interested in using such equipment for unloading and storing granular materials. In addition, foundries have successfully distributed prepared core sand to work stations pneumatically, using variations of pneumatic equipment found in packing houses and sewage disposal plants.

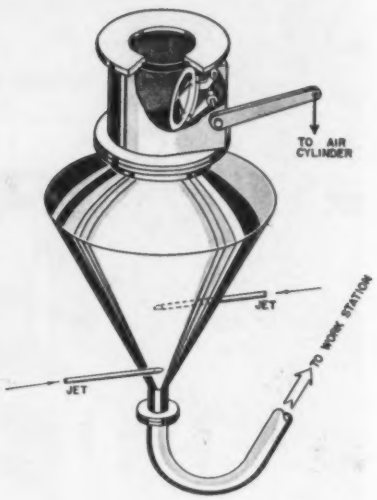
Prepared core sand has usually been handled with batch type conveyors not only because it is mixed in batches and contamination between batches is to be avoided, but because of the physical and chemical properties of core sand. Core sand containing drying oils is destructive to belts in belt conveyors and bucket elevators. Core sand also presents severe clean up problems due to its tendency to build up on the handling equipment. Accordingly, continuous conveyors which may tend to plug up and be difficult to clean are avoided if possible, and monorail cranes, skip hoists, industrial trucks or combinations of this equipment have been used.

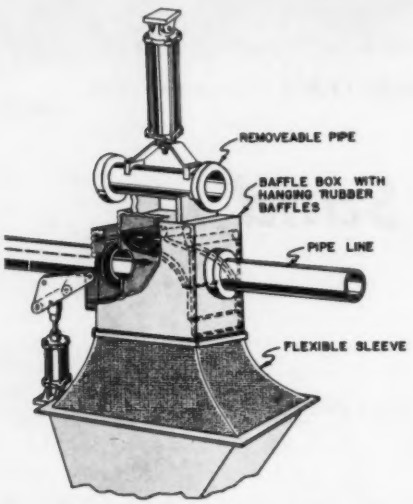
Batch type equipment, however, presents difficulties in some cases from a layout standpoint, particularly, in modernizing existing foundries. As cranes and lift trucks require head room and aisle space which is sometimes not available, a definite need existed for batch type conveying equipment of another type to supplement the existing monorail crane system. Pneumatic conveyors seem to be one answer to this problem.

A schematic arrangement of the pneumatic system used at Studebaker is shown in Fig. 2. The system contains four basic units: a pressure vessel, called a transporter (developed for use in packing houses and sewage disposal plants), a pipe line, a diversion valve developed in the plant to meet the particular requirements of the material being handled, and an air separator.

The transporter shown in Fig. 3 is simply a vessel into which a batch can be loaded, sealed, and aerated.







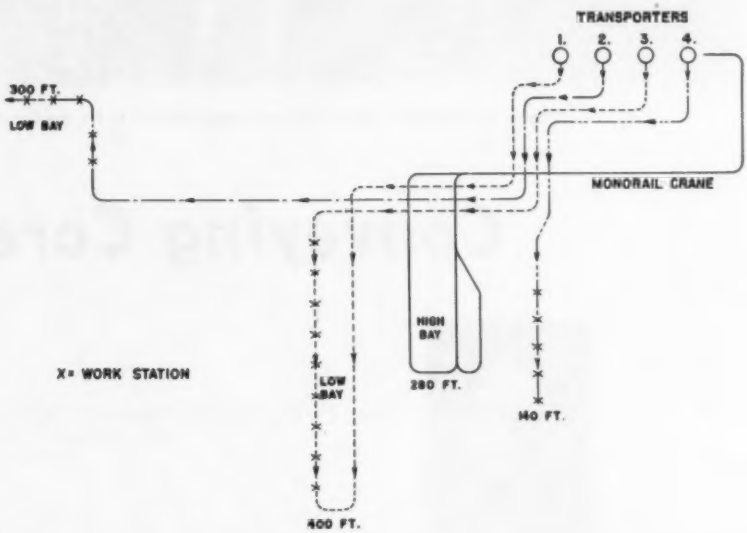


Fig. 2 (upper left) . . Pneumatic sand distributing system showing vent cyclone at work station.

Fig. 3 (upper right) . . Pneumatic transporter in which batch of sand gets initial shot of air.

Fig. 4 (lower left) . . Diversion valve side-tracks sand into storage bin of core making station.

Fig. 5 (lower right) . . Layout of pneumatic and monorail core sand distributing system.

It has a wide-mouthed gate on the top which can be opened and closed by means of an air cylinder. Around the periphery of the transporter, air inlets called jets are located at different elevations. The jets are connected to a compressed air line through an air pressure regulator and a quick opening valve.

Pipe Line Runs to the Area

From the bottom of the transporter a pipe line runs to the area to be serviced. The line generally used is a 4-in. diameter standard black pipe. The path of the pipe is laid out to avoid bends and changes in elevation as much as possible. At Studebaker, all turns are made with 6-ft radius tube turns. Flanged joints originally installed have now been eliminated at turning points.

As core sand must be delivered to a number of stations on the same pipe line, a diversion valve (Fig. 4), is located at each core making station. Because core sand is an extremely abrasive material, it was necessary to develop a special valve for this application. The valve developed consists of a removable section of the pipe line and a baffle box mounted together on a carriage so either one or the other may be put into alignment with the line and sealed in position. The seal must withstand full line pressure of 100 psi, although ordinarily pressures below 50 psi are used in operation. The baffle box provides a method for deflecting the material into a bin. As the rubber baffles hang loosely in the box, they absorb the shock of deflecting the material with a minimum of abrasion. As shown in Fig. 4, the valve is bi-directional, the function of the end baffles being to seal the pipe line on the side opposite to the entrance of the material. The baffle box is arranged so that baffles may be easily changed, and may be con-

nected to the work station bin by a flexible sleeve.

As the core sand is delivered by compressed air, provision was made to separate the sand from the air and exhaust the latter to the atmosphere. The major part of the separation is accomplished because of the momentum of the sand into the bin. However, as the air vent is located at the top of the receiving hopper and as a small amount of sand is carried out in the air, a secondary cyclone is located at each valve. The small amount of air-borne material carried out by each blow to a station is trapped in the cyclone and must be removed periodically.

Electric bin-level indicators were installed at each each work station to automatically signal to the dispatching station when a work station requires sand. As the valves are opened and closed remotely from the dispatching station, interlocks between the valves and the bin-level indicators were installed so a valve cannot be opened when no sand is required.

The Studebaker system consists of three pneumatic conveyors as shown in Fig. 5. Each system services a separate coremaking department which could not be serviced by the previously installed monorail crane system. One conveyor is of particular interest because it has a transporter at each end of the pipe line. This feature, possible because of the unique bi-directional valve, enables a delivery to be made to two adjacent stations on the same line at the same time, or any station on the line may be serviced from either transporter. In effect, a single set of valves is made to service two pneumatic conveyors. This feature is valuable in case of some breakdowns or where large tonnages must be handled quickly.

Uses Auxiliary Aeration Jets

In addition to the above equipment, the Studebaker system employs auxiliary aeration jets in the pipe lines at critical points. These jets are operated from the dispatching station during a blow and provide additional aeration where experience has shown it is required. Their installation has virtually eliminated the nuisance of "plug up" during a "blow."

The system is operated manually at the lowest possible blowing pressure because experience has shown maintenance of the system increases greatly with increased blowing pressures. The pressure used is dependent on the green strength of the sand being blown, by the condition of the equipment, by the number of bends in the line, and by the length of the line. Because of this, an automatic blowing cycle is not recommended as such an operation would require the use of higher blowing pressures than are required with skillful manual operation and in most cases would save no manpower.

The systems are operated by one man and a dispatching supervisor who has charge of all core sand preparation and delivery. During a typical blow the following operations are performed. The operator first opens a diversion valve at a station requiring core sand by means of a push button. He then selects the proper core sand mix from storage bins, measures the quantity to be blown roughly in a measuring hopper, and drops the material into the transporter. He then closes the gate on the transporter by an air valve and turns on his auxiilary pipe line jets by means of another valve. Next, air is introduced through the transporter jets in short bursts until a pressure gauge shows a pressure build up in the transporter.

The air valve is then turned on full and the aerated sand flushes out of the transporter while the operator maintains a fairly steady pressure in the transporter, by opening and closing the quick-acting valve as the sand moves through the line. By experience and feel the operator determines when the sand is approaching the work station. He then shuts off the air and allows the sand to coast into the bin. When his pressure gauge reads zero the operator clears the line with a quick burst of air and readies the system for another blow. Batches of 600 lb are usually delivered up to 600 ft from the distribution point in 20 to 30 seconds. The three systems on a typical shift handle about 70 tons of core sand.

Monorail Crane Is Standard

The monorail crane system is a standard layout delivering prepared core sand to areas in the foundry where there are high building bays. The system consists of monorail loops with switches from the core sand dispatching center to the areas serviced as shown in Fig. 5. Two cranes are used, each equipped with two hoppers holding 2500 lb each. The cranes are loaded from the same storage bins as those used for the pneumatic system. The pneumatic system operator also loads the crane hoppers.

No system of automatic bin level signals is required on the monorail crane system as the crane operators can inspect the bin levels as they travel over the system. The monorail system handles approximately the same tonnage per shift (about 70) as the pneumatic system.

The foremost advantage pneumatic conveying has over other conveying methods, and the reason it was selected when the Studebaker foundry was modernized, lies in its unique feature of being virtually unrestricted in its routing through a plant. By its use, coremaking areas can be located adjacent to molding areas to simplify the handling of baked cores, and widely separated coremaking areas with a centralized core sand mixing and distribution point are possible.

Fig. 6. . Storage bins can load either measuring hoppers in floor or monorail crane in background.

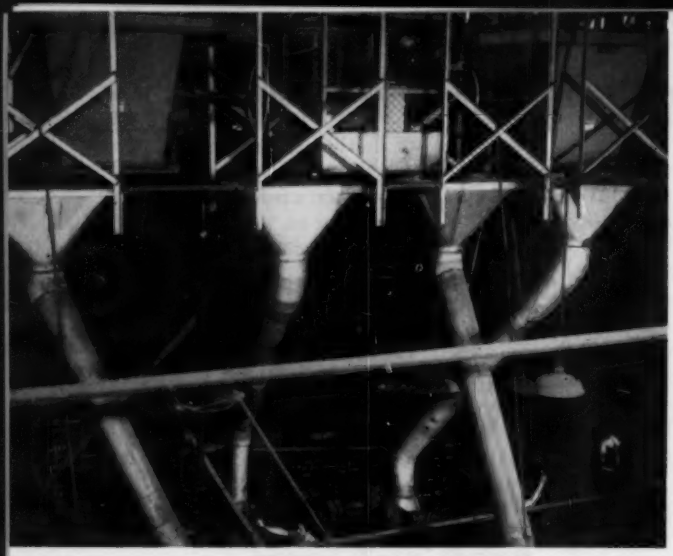
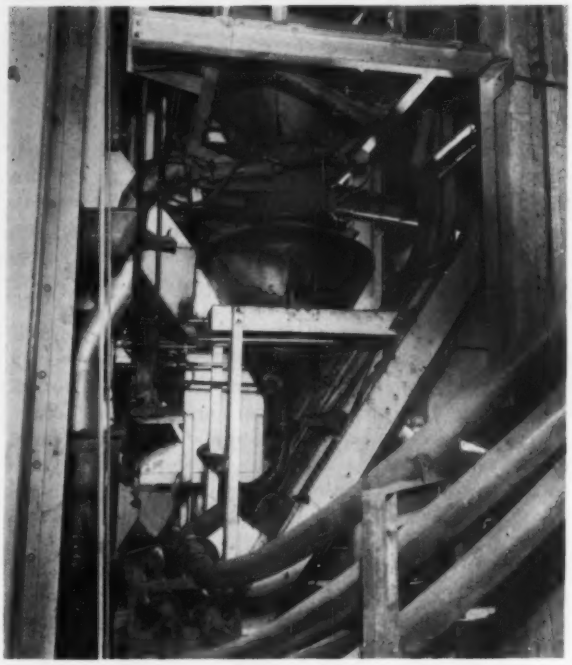


Fig. 7 (left) . . Monorail crane delivering core sand. Operator rides cab between two batch hoppers.

Fig. 8 (below) . . One of the four transporters in the Studebaker foundry core sand system.



Few problems of building clearances, bay heights, or aisle space will arise when laying out a pneumatic system as the pipe line can go up or down and around curves as desired without being restricted to one elevation as is a monorail crane layout. The erection of a pneumatic system is no more difficult than routing any pipe line, and superstructure is required only at valve locations.

Pneumatic conveying is faster and more efficient than monorail crane conveying as there is no lost time for return trips and the actual conveying time is a matter of seconds instead of minutes. A pneumatic delivery system is an easy system to supervise as all operations take place from a central point.

Breakdowns in a pneumatic system are neither costly nor serious, nor do they need skilled personnel to repair. A common breakdown is an air leak in a valve, pipe line, or transporter. Usually a leak will lower the efficiency of the system slightly, but may be left for repair till a down period occurs. Other breakdowns will usually affect one work station on a system while a crane breakdown may shut a monorail system down completely.

Plug Up Should Not Occur

A plug up should not occur in a properly designed and operated pneumatic system. At Studebaker, no plug up has ever necessitated taking down a pipe line nor has a plug up occurred since secondary air jets were installed.

A pneumatic system requires less man power than a monorail system of equal capacity and though skillful operation of a pneumatic system is important, errors in operation of the equipment are not apt to endanger the lives of other workers or cause serious damage to the equipment.

The capital investment required for a pneumatic system is usually lower than for a monorail crane system of the same capacity. The cost of a pneumatic system does not pyramid with the conveying distance as the major expenditures are for the aerating and valve equipment, and the pipe line is relatively inexpensive.

Finally, there may be distances beyond which it is impractical to convey pneumatically in a given plant, but work points at Studebaker 650 ft from the distribution center are serviced as easily as those adjacent to the distribution center.

In the author's plant, it is believed that the chief advantage found in the monorail crane system over the pneumatic system is in maintenance costs. A monorail crane system requires routine maintenance of a simple nature such as wiping off the equipment and greasing it periodically, but other maintenance is at a minimum under normal operations. Breakdowns are not frequent and can be avoided entirely with good maintenance.

Requires Daily Routine Maintenance

A pneumatic system on the other hand requires daily routine maintenance for efficient operation. The system must be cleaned daily, valves must be inspected and adjusted at frequent intervals, and curves in the pipe lines must be replaced or patched as required. Curves are expendable and though intelligent operation of the system can extend their life substantially, they will eventually wear out. Increased curve life through the use of abrasive-resistant materials has not proved out at Studebaker as the original and installation costs of such curves has not been offset by proportionally longer life.

Additional work stations on a monorail system can be installed at low cost and work stations can be moved around adjacent to the monorail with a minimum of effort as the work station hoppers can be supported directly from the monorail without additional superstructure. In a pneumatic system, work stations must be kept reasonably adjacent to the valve

gear in the line and additional stations require additional valves, valve superstructure and service cat walks.

Though it may not be efficient to deliver small amounts of sand to a work station with a monorail crane it can be done if desired. In a pneumatic system handling an air drying material such as prepared core sand, excessive drying out of the sand results when batches of under approximately 200 lb are blown, unless the operator is very careful.

Less control equipment is required for a monorail crane system than a pneumatic system. Bin level indicators are not required and a constant inventory of the sand available at the work stations can be kept by the crane operator. Generally speaking, the cost of power is less for a monorail conveying system than for a pneumatic one. No figures are available on this point and though the amount of air required for a pneumatic system is not great, electric power is generally cheaper than air power.

Finally, a monorail crane delivery system is a cleaner operation than a pneumatic delivery operation. When leaks occur in pneumatic conveying, sand gets blown around the area of the leak. In addition, a small amount of air-borne material is lost on each blow of a pneumatic system and is not only wasted but must be cleaned up periodically.

In conclusion, the results obtained at the Studebaker foundry in handling core sand pneumatically definitely show that pneumatic conveying is not only practical, but is a better method under certain conditions than the more common batch handling equipment such as lift trucks or monorail cranes. Experience also shows that pneumatic conveying of such material is not necessarily the best answer, if the use of lift trucks or monorail cranes is feasible.

Fig. 9. . Control panel for pneumatic system centralizes operation of all transporters and valves.

The chief disadvantage of pneumatic conveying of core sand is maintenance of the equipment; its greatest advantage is flexibility in routing. The chief advantage and disadvantage of a monorail crane operation are the opposite—low maintenance and sometimes difficult to route.

Combinations of batch handling equipment and pneumatic conveying equipment have merit and deserve cosideration. Often the best features of each system can be realized in such a combined layout.

Calendar of Future Meetings and Exhibits

October

3-7 . . Electrochemical Society, Inc.
Symposium on Vacuum Metallurgy. Hotel Statler, Boston. 106th meeting.

6-8 . . National Foundry Association
La Salle Hotel, Chicago. 56th Annual Meeting.

14-15 . . Michigan Regional Foundry Conference
University of Michigan, Ann Arbor, Mich. Sponsored by AFS Central Michigan, Western Michigan, Saginaw Valley, Michigan State College, and University of Michigan Chapters.

14-16 . . Foundry Equipment Manufacturers' Association
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

15-16 . . Northwest Regional Foundry Conference
Hotel Vancouver, Vancouver, B. C., Can. Sponsored by AFS Washington, Oregon, British Columbia, and University of Oregon Chapters.

16-19 . . Conveyor Equipment and Manufacturers' Assn.
The Greenbrier, White Sulphur Springs, W. Va. Annual Meeting.

18-22 . . National Safety Council
Conrad Hilton Hotel, Chicago. National Safety Congress and Exposition.

21-22 . . Fifth Annual National Noise Abatement Symposium
Illinois Institute of Technology campus, Chicago.

27-29 . . Grinding Wheel Institute & Abrasive Grain Association
Edgewater Beach Hotel, Chicago. Fall Meeting.

28-29 . . Purdue Metals Casting Conference
Purdue University, Lafayette, Ind. Sponsored by Central Indiana and Michiana Chapters of AFS and Purdue University.

28-30 . . All-Candian Regional Foundry Conference
King Edward Hotel, Toronto, Ont., Can. Sponsored by AFS Eastern Canada and Ontario Chapters.

29-30 . . New England Regional Foundry Conference
Massachusetts Institute of Technology, Cambridge, Mass. Sponsored by New England Foundrymen's Association and M.I.T.

29-Nov. 5 . . American Society for Metals
Palmer House, Chicago. 36th National Metal Congress.

November

1-5 . . American Society for Metals
International Amphitheater, Chicago. National Metal Exposition.

3-6 . . American Council of Commercial Laboratories
Roosevelt Hotel, New Orleans, La. Annual Meeting.

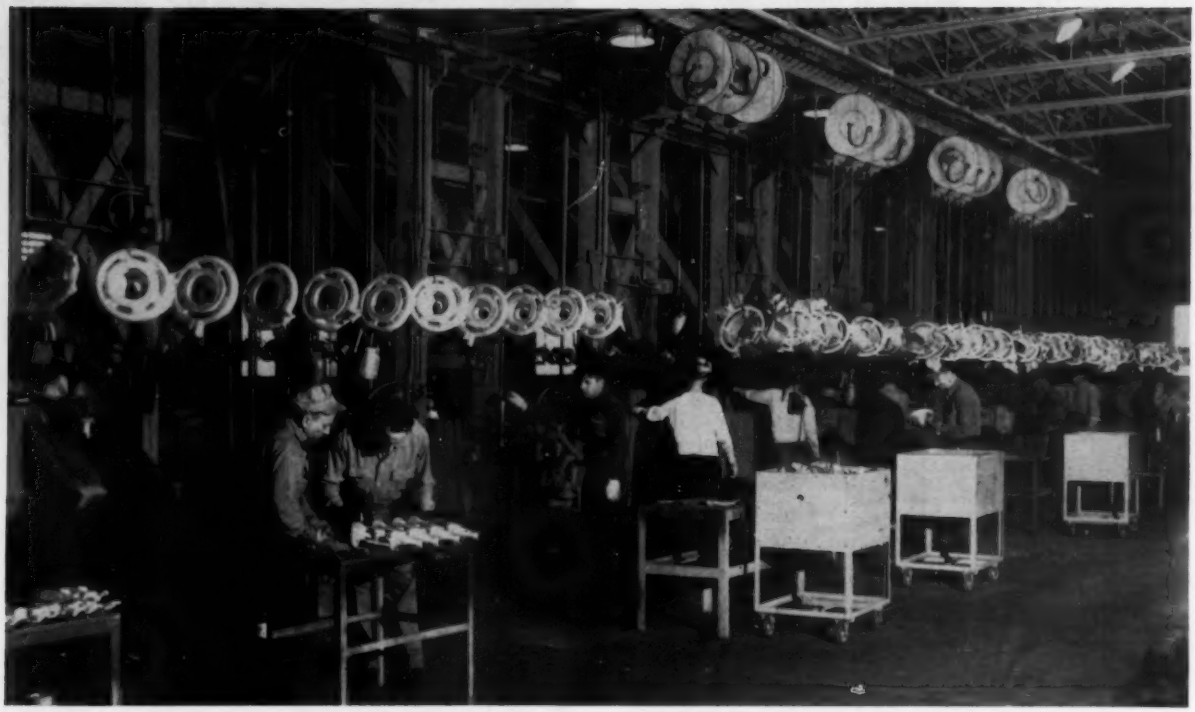
10-12 . . Industrial Management Society
Sherman Hotel, Chicago. 18th Annual Time and Motion Study and Management Clinic.

11-12 . . Gray Iron Founders' Society
The Homestead, Hot Springs, Va. Annual Meeting.

29 . . First International Automation Exposition
242nd Coast Artillery Armory, New York.

December

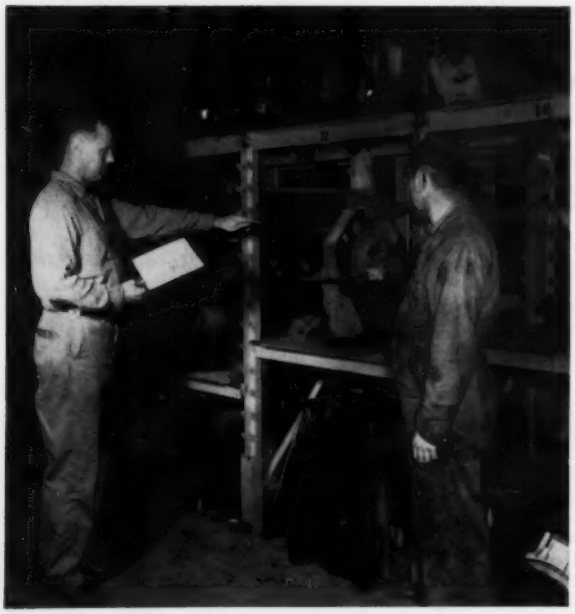
1-3 . . National Association of Manufacturers
Waldorf-Astoria Hotel, New York, N. Y. Annual Meeting.



Casting machine line with conveyor of castings approved for finishing by "hot" inspectors.

Mechanized Permanent Mold Casting

HERBERT F. SCOBIE / *Editor*



Selecting molds for future production is Merle Weltzin, Garske Perm Mold superintendent.

■ There's no limit to the size of a permanent mold casting. This has been the philosophy of the founder and president of Garske Perm Mold, Inc., St. Paul, Minn., since he started his first company—Progress Pattern & Foundry Co. nearly 20 years ago. This philosophy and his constant endeavor have resulted in a story reminiscent of those authored by Horatio Alger.

Beginning from scratch, Joseph S. Garske, a progress-minded orphan, served a patternmaking apprenticeship and eight years as a journeyman. Then in the lean days of 1935 he started his own shop with one man in half of a rented double garage. Today, with his first plant expanded on four occasions and a second company flourishing, he has complete facilities for producing all types of patterns, permanent molds, and both sand and permanent mold nonferrous castings.

Having been in the business of making permanent mold dies and castings since 1945, Garske formed a new company and built a new modern building in 1953. Using all the various light metal permanent mold alloys, the company currently produces castings ranging in weight from ½ oz to 80 lb and 3/32 in. to 1½ in. in section thickness. Housed in a modern, concrete block and steel sash building, the plant consists

Joseph S. Garske, president, Garske Perm Mold, directs attention to complicated mold. Lower half

racks down, upper half tilts back hydraulically. Band saw (above) is first stop in cleaning area.

of a large production room, a die and mold shop, an office and design department, a locker room, and a room for preparation and storage of mold sprays and spray guns. Dies and molds are stored in a basement which, because of the grade of the property, opens directly onto an alley.

Bulk of castings production is turned out on eight automatic tilting machines while about 30 per cent is done with conventional, hand- and hydraulically-operated equipment. Castings requiring only a single sprue are put on the tilting machines. Jobs requiring multiple sprues or risers are put on conventional machines.

Tilting Machines are Suspended

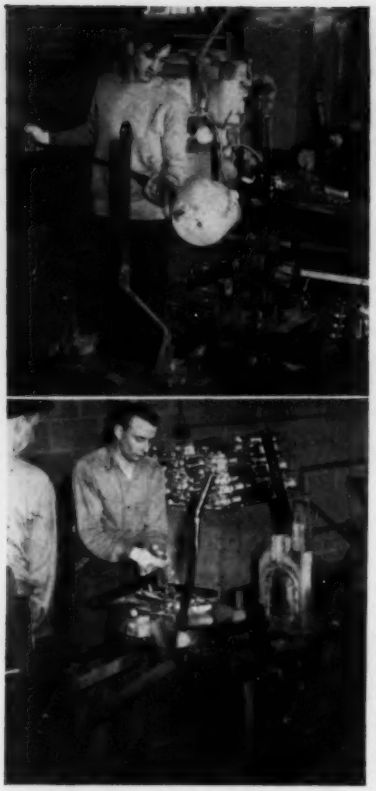
The eight tilting machines are suspended from the ceiling to promote better housekeeping and to give maximum clearance for molds, core levers, and mold clamps. Consisting primarily of a gas-fired metal reservoir with facilities for fastening molds on the front, the machines tilt to cast, hold momentarily, then return to level position for solidification, on a controlled cycle timed to a hundredth of a minute. A cycle concludes when, the end having been signaled by a red light going out, withdraws any metal cores used, the operator opens the mold, and removes the casting.

The operator starts a new cycle by blowing off the mold, spraying with insulating wash if necessary, closing the mold, positioning the cores, and pressing the starting button. Then the machine takes over on the automatically controlled tilt-hold-return cycle. A 500-psi central hydraulic unit operates the machines but each of the eight has its own complete set of controls.

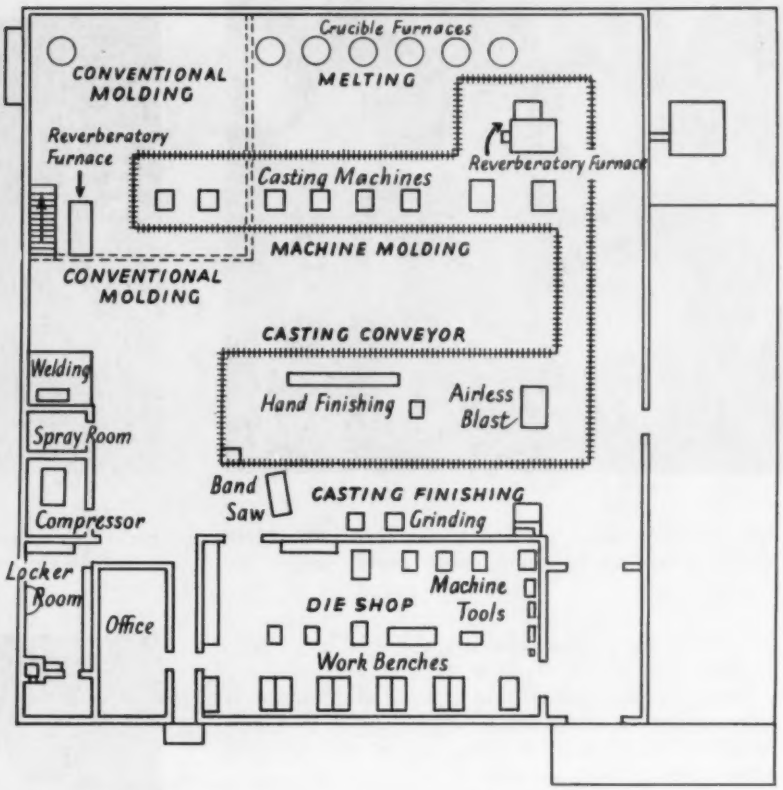
Temperature of the metal in the gas-fired reservoirs is automatically controlled. Thermocouples suspended in the melt are on trunnions so that the couples remain vertical throughout the cycle and do not bend when the casting machine tilts. Melters keep the machines full, the operators confining their attentions to the actual operation of the machines. Fluxing and skim-

Four of the crucible furnaces that melt aluminum alloys for casting machines. Middle man looks at pyrometer dial while checking metal temperature.

Melter fills casting machine at back. Pan catches dross and skimmings periodically removed by melter.



Hand operated molds also used.



Plant layout shows convenient arrangement and ample work space.

ming of the metal in the casting machines is also handled by the melters.

Melting facilities consist of two dry-hearth reverberatory furnaces and seven crucible furnaces. The firebrick-lined reverbs melt 600 and 2000 lb per hr. Four of the crucible furnaces are rated at 450 lb per hr, and two at 300 lb per hr; all six have silicon carbide crucibles. A seventh crucible furnace, with a steel pot for magnesium alloys, melts 350 lb per hr. Temperature control is manual in the crucible furnaces, fully automatic on the reverbs.

Hot castings come out of the molds onto waist-high metal tables where they are examined by "hot" inspectors who hook them onto an overhead chain-type conveyor. Largest castings go into large tote boxes on legs and casters. These wheeled, off-the-floor boxes are used throughout the shop for handling castings and returns. They ease work in the cleaning area by minimizing bending and twisting of workers. The 378-ft conveyor chain with hooks every 12 in. passes in front of the line of casting machines and back and forth several times so the castings will be cool by the time they reach the finishing area.

First station in the finishing area is the band saw where the operator removes gates, fins, and risers. Cold inspection starts here and continues till the castings are on their way to the customer. After band sawing, the castings are ground with abrasive belts on back-stand grinders. Additional finishing, if required, is done with small grinding burrs. Before shipment, castings are given a satin finish in an airless-blast tumbling unit with fine steel grit.

Garske Perm Mold designs and makes it own molds in its own completely equipped die and mold shop. Most are machined from inoculated-iron blocks although some are cast as close as possible to finished dimensions. Metal cores are made of a die-casting steel chosen for its resistance to attack by molten aluminum.

Heavy sections of castings are cored if possible. Result is not only a better casting, but a lighter one. Design principles followed include:

Modifying drawing for development of new permanent mold is Paul Fandrey, die shop superintendent.

Four-part mold open at end of casting cycle receives coat of insulating spray.

Machine shop of Garske Perm Mold has complete facilities for construction of metal molds and dies.

1. Keep the parting line simple.
2. Keep the metal section as uniform as possible.
3. Vent the mold cavity where ever possible.
4. Follow the rules of progressive solidification.
5. Gate to get smooth, uniform metal flow.
6. Use steel rather than sand cores if possible. (Sand cores require extra venting.)
7. Use as much draft as possible. (On cores that are drawn, as little as ⅓ of a degree per side is permissible.)

Sometimes copper chills are used as part of the mold to speed solidification of heavy sections too far from a source of feed metal. In some instances, cores are hollowed and cooled by a stream of air.

Inserts of all types and all metals are used in the castings. They include bearings, studs, nuts, lugs, etc., and are made of steel, iron, brass, and bronze. All inserts are preheated to insure dryness and to raise them to mold temperature. Knurled inserts are preferred, but smooth inserts can be used if they are keyed or otherwise held in by the casting.

Molds are made as mechanically perfect as possible and according to good foundry practice. They are used on an experimental basis until the proper thickness and proper location of washes is determined. A mold is started by heating 1½ hr to bring up to 300 F. Following a sprayed coating of insulating wash, then a graphite wash, the mold is again heated by means of a gas torch to bring it up to 500 F when it is ready for service.

Important at this stage is the development of a pattern of spraying, proper metal temperature, and correct tilting cycle. In extreme cases the gating may have to be changed. Two types of washes used are a proprietary insulating wash used to reduce solidification rate slightly, and a protective wash of graphite in water glass. The protective wash also acts as a lubricant and mild chill.

A record is kept on every mold to indicate the number of castings it can produce per hour, proper metal temperature, tilting time, and holding time.

Each casting machine has three overhead hose reels, one for compressed air, the others for the two washes. Each operator has his own spray guns which are kept in his gun locker in a room set aside for mixing and storage of sprays.

All possible facilities for comfort and sanitation are provided for the workers. The locker room has a terrazo floor with the lockers above floor level on a terrazo base to prevent rusting. Exhaust fans and hoods are located at all melting stations as well as at other critical points. The floor is kept clean with a portable industrial vacuum cleaner.

Services not available at Garske Perm Mold, such as making sand cores for certain castings, x-raying, and heat treating, are provided by Progress Pattern & Foundry Co., Garske's other company, not a stone's throw away.

Airless-blast tumbling gives castings satin finish.

1944
1815
NAZI SUBMARINE
U-505
THIS PRIZE OF WAR IS DEDICATED TO THE MEMORY OF
THE AMERICAN SEAMEN WHO WENT DOWN TO UNMARKED
OCEAN GRAVES HELPING TO WIN VICTORY AT SEA

Bronze plaque weighs approximately 150 lb, will memorialize seizing of Nazi U-505 by U.S. Navy in wartime action in south Atlantic Ocean.

Sub Capture Commemorated in Bronze

CAST from Navy specification M bronze, a memorial plaque made at Bronze, Incorporated, Chicago, will commemorate the permanent exhibit of the captured Nazi submarine U-505 at the Illinois city's Museum of Science & Industry.

The submarine, boarded and seized off French West Africa in 1944, is the first enemy vessel captured by the U.S. Navy since 1815. Disabled while under attack by ships of the Atlantic Fleet, the U-boat had risen to the surface and was about to be sunk by its crew when a party from the flagship *Guadalcanal* boarded it and succeeded in shutting off the scuttling valves.

Bronze, Incorporated, was founded in 1940 and made over 80,000 precision castings for the Navy during World War II. Partners in the enterprise, manufacturers of cemetery memorials, are Leonard Grosse and Frank O. King, the latter the creator of *"Gasoline Alley,"* syndicated cartoon strip featuring Skeezix and his pals. During the war, King used a female character known as Nina Clock, who worked in a foundry. These sequences were based on operations at Bronze, Incorporated.

A sculptured bas-relief at the top of the plaque shows the U-505 surfacing, with the *Guadalcanal* standing in the background. The ghostly image of an early Navy sailing ship rides the clouds above the sea.

The bas-relief was modeled in clay by a sculptor, then metal letters, designed and cast at the plant, were mounted on the clay mock-up. After the letters had been trued and secured in position, a plaster pattern was made.

The mold was rammed by hand in a wooden flask using a blend of several natural sands. Mold surfaces were

Below left . . Sculptor works on clay master pattern, preparing bas-relief of sea action and other decorative elements of the design. **Below right . .** After metal letters are mounted on pattern, artist trues them up preparatory to casting of plaster pattern.

Above left . . Plaster pattern is prepared for production of the mold. Above center . . With pattern in flask, specially mixed sand is rammed up by hand. Entire process involves highly skilled craftsmanship and careful hand tooling. Above right . . Workman smooths rough spots on sand mold after plaster pattern has been removed. Mold will be dried by charcoal fire before closing and pouring.

strengthened and hardened by drying with a charcoal fire. Metal was poured two up, a runner the length of the mold on each side, and numerous ingates insuring even flow. The metal was melted in oil-fired crucible furnaces.

Initial cleaning of the casting was done by sand blasting, followed by wire brushing. After the gates were cut and ground, the letters were chased with special steel tools designed and made at the foundry. Final tooling of letters and ornamental elements was a careful hand operation.

Chemical baths were used to achieve the exact patina desired—a rich copper bronze coloring that accentuates the detail of the bas-relief and provides a contrasting background for the raised letters.

Above right . . Two crews pour from opposite sides of mold to insure fast, even flow of metal. Below right . . Molders start shake-out by lifting cope with overhead chain hoist. Above . . Workman chases, trims, trues-up letters on casting with special hand tools. Plaque is next given decorative patina with chemicals.

Viewing tribute from their employees on 50th anniversary of the Pangborn Corp. which they founded are (right) Thomas W. Pangborn, president, and John C. Pangborn, first vice-president.

Celebrate Pangborn 50th Anniversary

FOUNDRY, civic, industrial, religious, and political leaders joined Pangborn employees and townsfolk September 1 in celebrating the 50th anniversary of Pangborn Corp., Hagerstown, Md., and in paying tribute to the brothers who founded the company—Thomas W. and John C. Pangborn.

Long associated with the foundry industry through their blast cleaning and dust control equipment, the Pangborns set up the first operating foundry exhibit and the company has exhibited in every AFS Show since the first held in 1906. They expressed their feelings for the industry when, during the 1954 AFS Convention, they presented $50,000 to the Society to provide scholarships to be administered locally by AFS chapters. An additional $5000 was made available for establishment of an award similar to those already in existence and administered by AFS.

Numerous tokens and citations recognizing the 50th anniversary and the two brothers, who continue actively to head the company after half a century, were presented. Tribute of the employees was a bronze plaque unveiled in front of the office building following a presentation speech by William B. Hays, Jr., finish grinder from the Pangborn foundry. Victor F. Stine, vice-president in charge of sales and engineering, unveiled the plaque.

Located at the base of the plant flagpole, the bronze casting reads: "Fifty years ago you founded this institution . . . high ideals, unselfish motives, inspiring leadership, courage, wisdom and fair dealings won our loyalty and esteem . . . we who work with you are spurred by your many acts of kindness and generosity . . . we extend congratulations on this fiftieth anniversary of Pangborn Corporation, and pledge continued loyalty . . . with God's blessing, may health and happiness be yours through the coming years . . . this is the earnest and prayerful wish of your employees."

Speaking on behalf of himself and his brothers, Thomas Pangborn expressed deep gratitude for the tribute as he recalled the humble beginning of the company. Pointing out that comforts, amusements, and riches are empty goals, he said, "We all exist to do creatively, as craftsmanlike as we can, all things that must be done. We find inner peace when we work at whatever is before us not primarily for the pay we get, not for applause or gratitude, but for the sheer joy of creating, for the pride we have in what we produce."

Small replicas of the 50th anniversary medallions were presented to the two founders of the corporation by P. J. Potter, vice-president, in behalf of himself the other two members of the board—Victor Stine and Lloyd L. Stouffer, secretary-treasurer.

Representing field sales personnel, Bruce R. Artz, Syracuse N. Y., presented the Pangborn brothers with scale models of the company's first sand-blasting machine made up as desk sets.

John Pangborn presented to Howard Easton, eldest shop employee in point of service, a golden anniversary medallion of the type presented the following day to all Pangborn employees.

Certificates of tribute expressing appreciation to the Pangborns for helping to make Hagerstown "a better place in which to live and make a living" were presented by Harold M. Porter, president of the Hagerstown Chamber of Commerce.

Robert G. Merrick, president of the Equitable Trust Co., Baltimore, Md., of which Thomas Pangborn is a board member, presented him with a citation.

Theodore R. McKeldin, governor of Maryland, presented a certificate of appreciation citing the brothers for their contributions to the state of Maryland, and for the philanthropies of the brothers and Pangborn Corp.

The Rev. Theodore M. Hesburgh, president of Notre Dame University, thanked the Pangborn brothers for their moral and financial support to many charitable causes throughout the country. "In no other country on earth could this have happened—where two poor young men can bring forth in 50 years the things we see here. I am deeply inspired and deeply heartened," he said.

Lloyd Stouffer presided throughout the program.

The day, which had started with a plant open house, ended with a reception at which the Pangborn brothers were hosts.

The following day the 50th anniversary celebration concluded with a Broadway variety show staged in Pangborn Park, across the street from the plant, for company employees and their families.

Pangborn Corp. had its beginnings in New York when Thomas Pangborn formed the organization in 1904. Born in Brooklyn, he grew up in LeRoy, Minn., entering industry at the age of 17 with Belleville Copper Rolling Mills, Newark, N. J. Attending Pratt Institute evenings, he began experiments which led to the first of the 28,000 machines now serving industry.

In 1905 John Pangborn left Western Electric Co., to join his brother in the new company. In 1908, the organization moved to Jersey City, N. J., and in 1912 to Hagerstown where the present plant (started in 1915) now covers 11½ acres. The 12 modern structures include a foundry, pattern shop, plate, sheet metal, and machine shops, assembly plants, paint, and woodworking shops. These make Pangborn Corp. one of Maryland's largest industrial enterprises.

With over 1000 employees, Pangborn has 451 who have been affiliated with the company from ten to 48 years.

To sell its products, Pangborn maintains a large home office sales organization. The field sales staff consists of 35 district sales engineers and dealers and foreign representatives are located in nine overseas areas.

. . . Finer finished castings with NATIONAL BENTONITE bonds!

It's easy to see why many good foundrymen rely on National Bentonite for better bonded molds — they can count on better castings, requiring less time in the cleaning room.

Check these qualities: consistently uniform high quality . . . good green strength . . . high hot strength . . . high tensile strength . . . high permeability . . . high deformation . . . high sintering point . . . good mold durability — and specify National Bentonite for better bonding. It requires less water to temper correctly, too. Use National Bentonite and be sure.

Baroid

Baroid Sales Division ☆ National Lead Company

Bentonite Sales Office: Railway Exchange Building, Chicago 4, Illinois

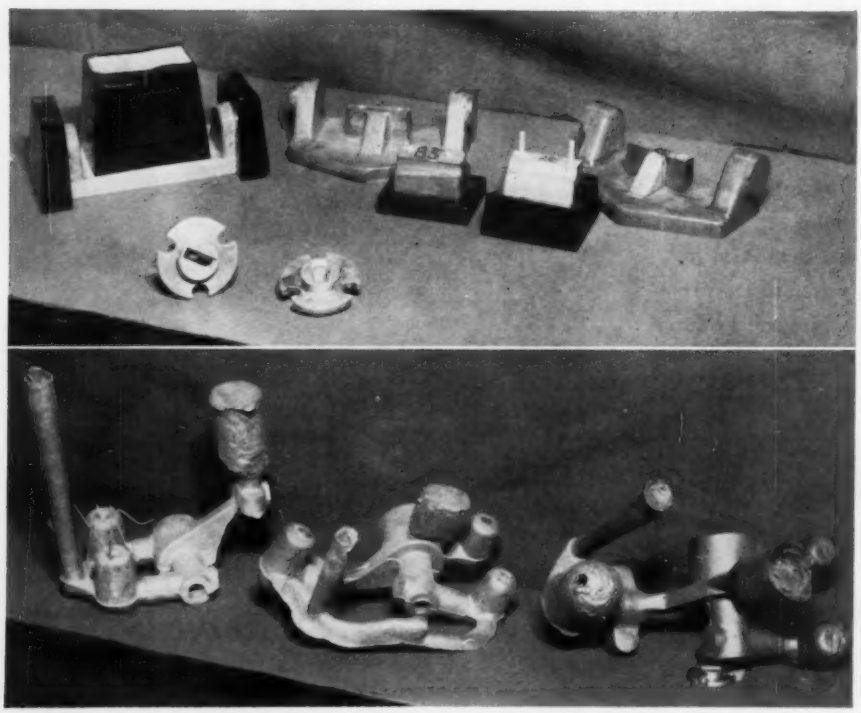
● Quick Service from Better Foundry Suppliers Everywhere

For more data, circle No. 557 on postage-free Reader Service card on p. 17 or 18

1954 AFS Apprentice Contest broke all records for numbers of individual, chapter, and company entries, and for general interest in the competition. The Contest booth (above) attracted considerable attention from foundrymen visiting the AFS Convention and Exhibit.

1954 Apprentice Contest Establishes New Records

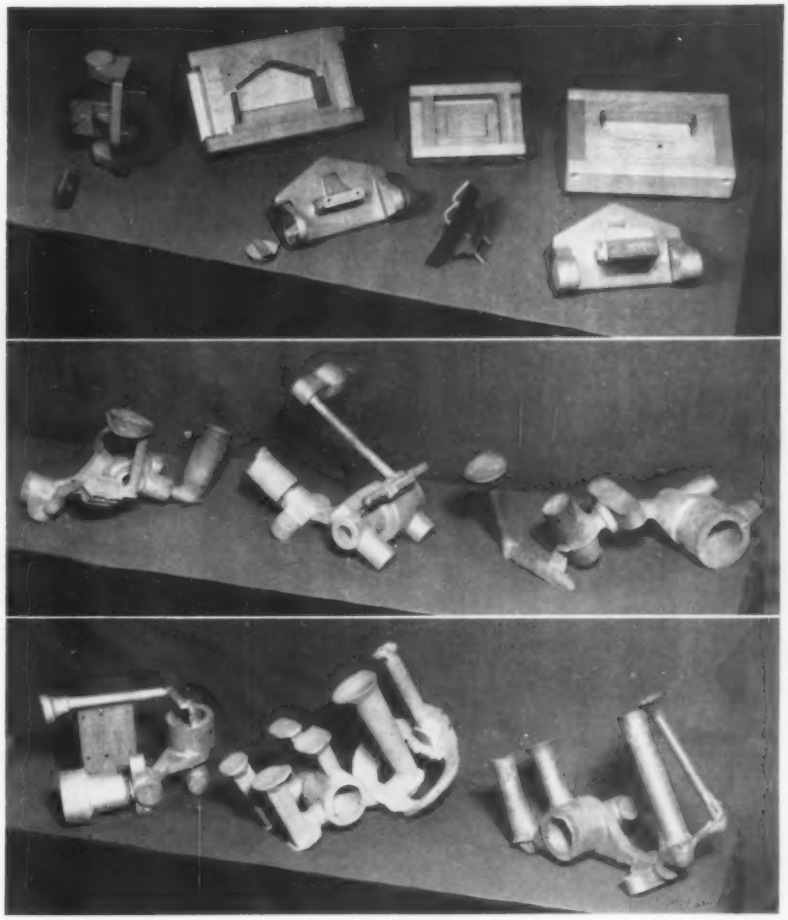
PROF. R. W. SCHROEDER/*University of Illinois, Chicago*



Left above . . These patterns were not winners at Cleveland. Use of excessive cores on pattern at left added to cost and increased molding difficulty. Large center core reduced space between core print and lugs, producing narrow sand strips broken easily in drawing of pattern or setting of core. Contrasting dowel pins are in evidence in pattern construction of loose pieces as shown at center and right. Pins short as these might have been left off, since they afford no support while ramming. More core than necessary was used for the cover core on pattern at right. Left below . . These steel casting winners are, from left: third, second, and first. Atmospheric risers and knock-off cores, careful placing of risers, and lack of fins on parting surfaces indicate competent work. Surfaces of this difficult-to-mold job indicate good sand control and proper ramming technique. Risers are necked to give clear cut-off point between risers and castings.

Right above . . Wood pattern division third, second, and first prize winners, reading from left to right. Exhibits show fine workmanship, accuracy according to blue print, and ease of molding. Good pattern construction in all winners. Dove-tailed and pinned loose pieces well made and anchored to insure proper location and ease of removal from pattern and mold. Parting line easy for molder to follow; ample draft has been allowed; and close-over allowance on adequate core prints should insure accurate location of cores. **Right center . .** These prize-winning gray iron castings, also shown third, second, and first, reading from left, indicate good gating practice, riser economy and effectiveness, plus clean-cut partings. Absence of fins and clean casting surfaces show well established parting lines on the complex job, and good sand control. Good yield is apparent on all three entries. Center casting used exceptionally high cope, adding somewhat to molding problems. Soundness of casting at right, as shown by x-ray, would indicate that a much shallower cope should have been used.

Right below . . These are non-ferrous winners, reading from left: third, second, first. Center casting is magnesium and requires what gray iron, many brass and bronze, and some steel founders would consider excessive gating and risering. Apprentices would profit by studying the various methods of gating and risering shown in these winning entries.



Announce 1955 Apprentice Contest

THE 1955 AFS Apprentice Contest opens officially October 4, 1954, with provisions for entry of beginners not registered as apprentices, as well as bona-fide apprentices. Climax will come with the presentation of awards during the Annual Business Meeting at the Houston (Texas) Convention next May.

The Apprentice Contest awards prizes of $100, $50, and $25 for first, second and third places, respectively, to the winners of the five divisions: Gray Iron Molding, Non-Ferrous Molding, Steel Molding, Wood Patternmaking, and Metal Patternmaking. In addition, first place winners in each division receive round-trip rail and Pullman transportation between their homes and the convention city.

Broadened this year to make a greater number of potential contestants eligible, the contest is open for the first time to learners, trainees, and students, as well as apprentices.

Revised eligibility regulations specify that the term "apprentice" shall for purposes of the competition be understood to mean a learner or trainee in the all-around practices of the foundry trade, who has not had over five years' experience in the pattern trade, nor more than five years in the foundry trade.

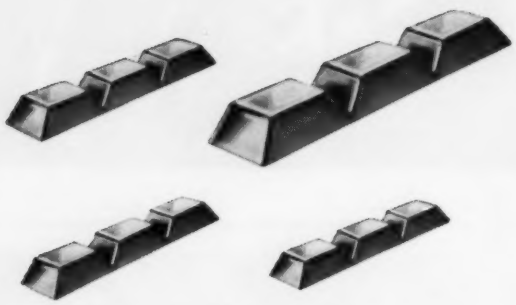
All learners and trainees entering the contest must be registered on company payrolls as a learner or trainee.

Students of trade, vocational, or high schools are eligible to enter individual chapter contests at the discretion of the chapter involved. Such entries, if successful in chapter competition, will be considered on an equal basis with regularly enrolled apprentice entries. The amount of training completed shall have no bearing on eligibility for this contest and is not considered in the judging.

Regulations have been further amended to provide that, in any one year, a contestant shall have one chance to compete in but one division of the contest. Also, molding division contestants will have to record the gross weight of their castings on the contest identification tag, and ferrous castings, after being sand-blasted, should be coated with transparent lacquer to prevent corrosion of the casting.

Full information on the 1955 AFS Apprentice Contest can be obtained from AFS chapter educational committee chairmen or from A. B. Sinnett, Educational Director, American Foundrymen's Society, 505 State St., Des Plaines, Ill.

...FACTS YOU NEED TO KNOW ABOUT ALUMINUM INGOT FROM SMELTERS



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The Foundry and Die Casting Industries' best insurance is a strong and vigorous Aluminum Smelting Industry

The best insurance for continued growth of the Aluminum Casting Industry lies in the opportunity for unlimited choice from the many independent producing units constituting the Aluminum Smelting Industry, which offers fast and specialized service and provides quality alloys for FOUNDRYMEN FIRST.

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Foundry Facts

Analysis of Casting Defects

Casting defects may be of three types: 1—major defects which make the casting a total loss; 2—defects which cost so much to repair that it is questionable whether to salvage or scrap the casting; and 3—minor defects which allow economical salvage of the casting. Although all defective castings cannot be classified as scrap, a defective casting always represents a loss to the foundry producing it. Even though slightly defective castings can be salvaged, there is an expenditure of time and material which affects the profitable operation of a foundry. Recognition of this and response of foundrymen to talks on cause and cure of foundry scrap resulted in the AFS publication *Analysis of Casting Defects from* which this months Foundry Facts is excerpted.

Thirty-one basic casting defects, attributable to 10 specific and one general phase of foundry operation, are listed in the adjacent chart. The chart can be used in curing scrap troubles by calling a meeting of persons familiar with the various foundry operations related to the production of the castings in question. This group should study the defective castings, consider over-all conditions, and establish basic causes. The chart, along with *Analysis of Casting Defects*, assists in this.

Although originally intended primarily for gray iron foundrymen, the chart and book are useful to all foundrymen since only four of the defects (mass hardness, hard spots, inverse chill, kish) are peculiar to gray iron, while the others occur at some time in all foundries.

Several defects caused by the operating factors shown on the chart are illustrated on the following page. Definitions of the 31 defects, with which identification and cure must start, are:

1. Blows or **Gas Holes.** Rounded cavities caused by generation or accumulation of gas or entrapped air. They vary in size over a wide range and the walls may vary in color from dark blue to a silvery metallic luster. Blow holes caused by trapped bubbles of gas in the metal rarely occur on the drag surfaces. They may occur as a smooth depression on the sides or cope, or as a series of jagged, irregular depressions on the cope, especially on flat surfaces. Core blows generally show on or near the surfaces of the cored cavity. Blows caused by chills, chaplets, or wires are found as one or more gas pockets adjacent to these inserts.

Porosity caused by steam or gas passing through the metal, which may be accompanied by inclusions of dirt or dross, is a blow. Such porosity may resemble a shrink or dendritic area and frequently is mistaken for a shrink. **Pin Hole.** A portion of the casting, or sometimes the entire surface, may be pitted with small holes about the size of a pin point. A pin hole may be a surface indication of a sub-surface blow hole. **Blister.** A shallow blow with a thin film of iron over it appearing on the surface of the casting.

2. Scars are generally found on a flat surface where entrapped gas has prevented the mold cavity from being filled completely. **Plates** are formed when metal oozes into a scar. A **seam** is a surface defect related to but of lesser degree than a cold shut.

3. Shot iron or **cold shots** are small globules of metal embedded in, but not entirely fused with, the casting. In many cases, shot iron may be caused by a blowing action somewhere in the mold cavity and although the blowing action may cease and the metal sections become sound, the shot may remain.

4. Shrinkage, large or small, results from varying rates of contraction while the metal is changing from liquid to solid. A true shrinkage defect is generally a jagged hole or spongy area lined with fern-like crystals called dendrites. These true shrinkage defects must be differentiated from hot tears and cracks.

5. Hot tears and **cracks** are surface discontinuities or fractures caused by either external or internal stresses or a combination of both acting on the casting. They may be due to (a) chemical composition, (b) linear shrinkage, or (c) mechanical causes. The chemical composition affects both the contraction at solidification and the linear shrinkage. Hot tears or cracks formed during cooling generally are discolored, ranging from bluish to reddish. A clean or fresh fracture generally indicates a crack from mechanical causes, or external stresses, after cooling has been completed.

6. Mass hardness is a condition in which the entire casting is too hard. It is either unmachinable due to being white in structure, or it is uniformly too hard to machine at the required feed and speed, although machinable at slower rates.

7. Hard areas and **chilled spots** adversely affect machinability. Shot iron is a special case of this type of defect.

8. Warpage is deformation other than contraction that develops in a casting between solidification and room temperature.

9. Open grain structure is a defect wherein a casting, when machined, appears too coarse grained for the application. This structure may be general or it may be localized and is caused by the presence of large, coarse graphite flakes.

10. A misrun casting lacks completeness due to failure of the metal to fill the mold cavity. There may be a smooth, round-edged hole through the casting wall or one or more extremities may be only partially filled out. A **coldshut** is a definite discontinuity due to imperfect fusion where two streams of metal have converged.

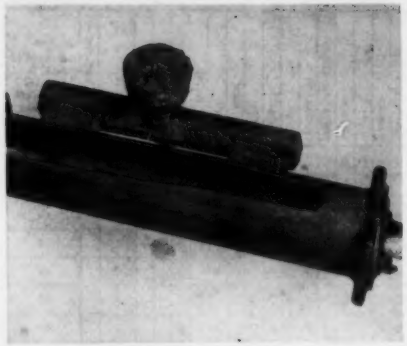
11. Inclusions are particles of material (generally non-metallic) embedded in the metal. If these are at the surface, they generally are removed during cleaning, leaving only the holes. Sand or dirt inclusions may be the result of cuts or washes anywhere in the mold, including the gating system. Inclusions may be due to undissolved ladle additions or segre-

DEFECT / OPERATING FACTOR (■ = MAJOR CAUSE, ○ = MINOR CAUSE)	BLOWS	SCARS AND PLATES	SHOT IRON	SHRINKS	HOT TEARS AND CRACKS	MASS HARDNESS	HARD OR CHILLED SPOTS	WARPED CASTING	OPEN GRAIN	MISRUNS AND COLDSHUTS	INCLUSIONS	CUTS AND WASHES	SCABS, EROSION	SCABS, EXPANSION	CRUSHES	DROPS	STICKERS	ROUGH SURFACES	PENETRATION	FUSION	SWELLS	SHIFTS	CORE RAISE	RUNOFF	CORES WRONG	RUNOUTS AND BLEEDERS	BROKEN CASTING	INVERSE CHILL	POURED SHORT	RUSH	DEFECTIVE TEST SPECIMEN	NUMBER OF DEFECTS CAUSED BY EACH OPERATING FACTOR
A. DESIGN	○	○		□	○		○	○	○	○	○	○			○		○	○	○		○	○	○			□						19
B. PATTERN EQUIPMENT		○	○	○	○		○	○	○	○						○	○	■	○		○	■	○	○	○							19
C. FLASK EQUIPMENT AND RIGGING	■	○			○		○	○		○			○	○	■	■	○	○	○		○	○		○	○	○						19
D. GATING AND RISERING	○	○	■	○	○		○	○	○	○	■	■	○	○		○	○	○	○	○	○		■	○		○						22
E. SAND	■	○	■		○	○	○	○		○	■	■	■	■	○	■	■	○	■	■			○	■		○						22
F. CORES	■	○	○		○	○	○	○		○	○	○	■	○	○		○	○	■	■	○	○	○		○	○						22
G. MOLDING PRACTICE	■	○	○		○		○	○	○	○	○	○	■	○	■	■	○	○	■	○	■	○	○	■	○	○						24
H. METAL COMPOSITION	○	○		○	■	■	○	○	■	○								○	○								○		○			13
I. MELTING PRACTICE	■	○		○	○	○	○	○	○	○	○																○		○			12
J. POURING	■	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	■	○	○	○	○			○		○	○			25
K. MISCELLANEOUS	○	○			■	○	○	○	○	○	○			○	■	■							■			○	○				○	13
NUMBER OF OPERATING FACTORS CAUSING EACH DEFECT	10	11	4	7	11	4	11	11	8	11	8	6	6	6	7	8	7	9	9	5	5	5	6	5	4	8	2	3	1	2	1	

Outline of Causes of Gray Iron Casting Defects

Analysis of Casting Defects

(continued from preceding page)



Misrun

Plate

Hot Tear

Chilled Edge

gations of metalloid combinations. **Sand holes** are cavities of irregular shape and size, the inner surfaces of which plainly show the imprint of a granular material. **Slag inclusions** may be due to slag from the metal, ladle, mold, or core materials. Such inclusions may vary from a cinder to a vitrified mass and may be confused with sand holes or blow holes if the inclusion has been removed.

12. **Cuts** and **washes** are the result of erosion of sand by metal flow. They appear as rough spots and excess metal at the place where the defect occurs; usually sand inclusions appear at some other part of the casting. Gas erosion defects usually occur in the cope, riser necks, or adjacent to the riser. They are due to the cutting action of hot gases passing through restricted openings at high velocity.

13. **Erosion scabs** occur where the metal has been agitated or boiled, or has partially eroded the sand, leaving a solid mass of sand and metal. Some of the eroded sand generally finds its way to the cope of the casting as dirt or inclusions.

14. **Expansion scabs** are rough, thin layers of metal partially separated from the body of the casting by a thin layer of sand, and held in place by a thin vein of metal. They are readily chipped off and in many cases if not caught at the shakeout, appear as in indentation in the casting. This indentation is generally called a **buckle.** A **rattail** is a minor buckle, occurring as a small irregular line or lines. A **blacking scab** is formed by the blacking flaking off due to sand expansion and being retained in or on the surface of the metal. A **pull down** is a buckle in the cope, sometimes severe enough to cause a scab.

15. **Crushes, push-ups,** and **clamp-offs** occur as indentations in the casting surface due to displacement of sand in the mold.

16. A **drop** is a defect in a casting due to a portion of the sand dropping from the cope or other overhanging section.

17. A **sticker** or **rat** is a lump on the surface of a casting caused by a portion of the mold sticking to the pattern.

18. A casting lacking the required degree of smoothness has a **rough surface.**

19. **Metal penetration** is a surface defect which looks as though the metal has filled the voids between the sand grains without displacing them.

20. **Fusion** is a surface defect having a rough, glassy appearance due to sand fused to the surface of the casting. It is commonly confused with penetration.

21. **Swells, fins, strains,** and **sags** result in the castings not being true to the pattern because the metal sections are greater or less than required. A swell is an increase in metal section due to the displacement of sand by metal pressure. A fin is a thin projection of metal from the casting. A strain is a type of swell wherein the mold surface has cracked and permitted the metal to form a fin. A sag is a decrease in metal section due to sagging of the cope or core.

22. A **mold shift** results in a casting which does not match at parting lines. A **core shift** results in a variation from specified dimensions of a cored section due to a change in position of the core or misalignment of cores in assembling.

23. A **core raise** is caused by a core moving toward the cope surface of a mold resulting in a variation in wall thickness. This is a special case of a shift.

24. A **ramoff** or **ramaway** results from a section of the mold being forced away from the pattern by ramming sand after it has conformed to the pattern contour. It may resemble a localized swell or shift.

25. **Wrong core, improperly set core,** and **omission of core** all result in a defective casting.

26. **Runouts** and **bleeders,** sometimes called **breakouts,** result in a casting lacking completeness due to molten metal draining or leaking out of some part of the mold cavity during or after pouring. Runouts occur during pouring; bleeders occur after pouring has stopped.

27. **Broken castings.** A casting broken by mechanical action. Extreme conditions causing hot tears and cracks may result in broken castings.

28. **Inverse chill,** also known as **reverse chill, internal chill,** and **inverted chill,** is the condition in a casting section where the interior is mottled or white while the outer sections are gray. Generally found in lighter section castings.

29. **Poured short.** A casting which lacks completeness due to the mold not being filled.

30. **Kish** is free graphite which has separated from molten iron. It generally appears on the cope surfaces of castings as black, shiny flakes, resembling the familiar loose graphite sold for lubricating purposes.

31. A **defective test specimen** can result in the rejection of sound castings. This defect covers acceptable castings rejected because of failure of test bar or test specimen to meet chemical, microstructure, physical and/or mechanical tests.

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Foundry Tradenews

Semet-Solvay Div., Allied Chemical & Dye Corp., has appointed as its coke sales agent in the western United States and in the province of British Columbia, Canada, **Wilson & Geo. Meyer & Co.,** whose main offices are in San Francisco, Calif.

Ownership of **Chicago Pump Co.** has been acquired by **Food Machinery and Chemical Corp.** through an exchange of stock. Chicago Pump's plant, offices, identity, policies, management and sales representatives will remain intact. Its operations will be coordinated with the executive management of Food Machinery and Chemical Corp.

Midwest Precision Castings Co., Cleveland, has available booklet, "How To Design Precision Investment Castings." Profusely illustrated book is written as a guide to metal working executives and design engineers who wish a file of both the benefits and limitations of the "lost wax" investment casting process.

An $800,000 expansion and modernization program to increase casting capacity, has recently been completed at **Empire Steel Castings, Inc.,** Reading, Pa. The program has reportedly doubled plant area and tripled production capacity. Modernization program includes new sand storage bins, mechanized sand handling system, new electric furnace of five tons capacity, new core shop equipment, new monorail pouring system, entire new pouring area, new high production molding equipment, new shakeout unit and cleaning equipment, and a new conveyorized cleaning shop.

Metallizing Engineering Co., Inc., has moved its eastern offices, factory and warehouse from 38-14 30th St., Long Island City, N. Y., to 1101 Prospect Ave., Westbury, Long Island, N. Y.

Enterprise Engine & Machinery Co., subsidiary of **General Metals Corp.,** has changed its Chicago address to 1737 W. Howard St.

Seeing a need for replacement grates for Canadian Steam Boiler Equipment, Ltd., announcement is made by **Toronto Foundry Co., Ltd.,** that they now have available shaking grate bar equipment in both Cyclone and 20th Century Styles.

Beloit Castings Co. has just won special recognition from its compensation insurance carrier for a safety record far better than average. In making the presentation, J. K. Meeley, Madison safety engineer for Employers Mutuals of Wausau, praised the firm's all-out efforts to safeguard vision, and cited the efforts in the over-all accident prevention program. Basic in the company's program are the informal safety meetings held periodically in each department, in which the foremost hazards and the most important safe practices are discussed.

National Lead Co., as operating contractor, has selected the firms of Frederick Snare Corp., and the Merritt-Chapman & Scott Corp., both of New York City and Havana, Cuba, to perform the construction necessary to expand the nickel plant at Nicaro, Cuba. The Office of Defense Mobilization has authorized the investment of up to $43,000,000 for the overall task of enlarging the capacity of the Government-owned installation by 75 per cent.

General Smelting Co., Philadelphia, Pa., has been appointed a distributor of Kaiser Aluminum ingot for the **Kaiser Aluminum & Chemical Sales, Inc.** General Smelting will service foundries east of Pittsburgh, Pa., including those in New York, New Jersey, Maryland, Pennsylvania and the New England states.

Labquip Corp., Chicago, has been appointed Midwest sales representatives for **Technical Operations, Inc.,** Arlington, Mass., in an area including Illinois, Northern Indiana, Wisconsin and Michigan. Industrial products which use radioactive isotopes will be handled by the Chicago firm. One product for use primarily in foundries, for the detection of flaws in castings, is the Directional Exposure Shield.

The first aluminum ingot was poured recently at Kitmat, British Columbia, marking the completion of the first stage of the vast hydroelectric and aluminum smelter project constructed by **Aluminum Co. of Canada, Ltd.,** on the Pacific coastline of Canada. Spread out over an area of 160 miles in width and 60 miles in depth, the development will eventually have a hydroelectric capacity of 2,240,000 hp, the largest ever undertaken by private enterprise.

A new, extremely hard, abrasion-resistant iron alloy has been announced by **Taylor-Wharton Iron & Steel Co.,** High Bridge, N. J. The alloy can be heat treated to 700 Brinell. Typical applications, for which field tests have been reported, include blades for propulsion of blasting grit and steel shot in airless centrifugal blast cleaning equipment, tube elbows in pneumatic metal chip handling systems, and many others. The new alloy has indicated a life expectancy of two to six times other alloys used for the same purposes.

Frederic B. Stevens of Canada, Ltd., has purchased the **Roto-Finish Co. of Canada, Ltd.,** including manufacturing rights and complete inventory. Roto-Finish complete line of metal finishing tumbling equipment, processes and supplies will be stocked in the Stevens Toronto and Windsor warehouses.

Campbell, Wyant and Cannon Foundry Co., has just published a 24-page book, "One Source for Your Casting Needs," which furnishes up-to-date information on all types of gray iron and steel castings. Shown are intricate castings and general purpose castings; those with special properties and those that are heat-treated; castings that are produced in limited quantities and in large production runs; and castings that are made centrifugally.

Baker Perkins, Inc., Saginaw, Mich., has acquired controlling interest in the **Marco Co., Inc.,** Wilmington, Del. Technical research and development engineers, as well as key manufacturing and service personnel are moving to Saginaw.

National Foundry Sand Co., Detroit, has sold the **Sonsel Refractories Co.,** Brighton, Mich., to the **International Minerals and Chemicals Corp.,** Chicago.

The establishment of four new sections in the **Development and Research Div., International Nickel Co., Inc.,** have been announced. New sections are: Constructional Alloy Steels, Electro-plating, Inco-Nickel Alloys Development, and Stainless Steel and Heat-Resistant Alloys.

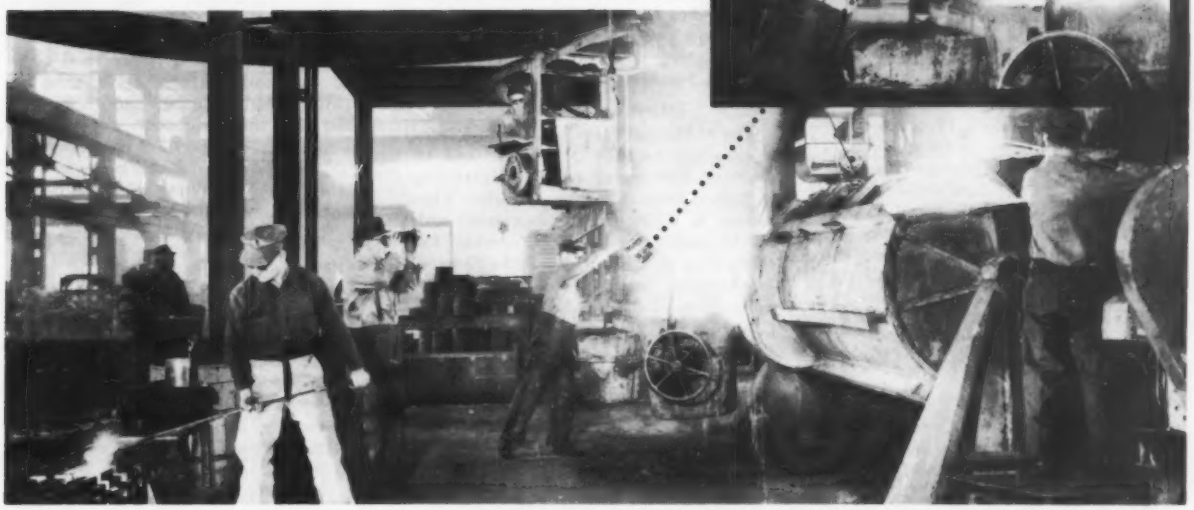
Photograph of the first national sales meeting of the Grindle Corp., Harvey, Ill., held recently in that city, shows President Aubrey Grindle surrounded by members of his office staff and some of his coast-to-coast representatives.

Caterpillar® Uses Molybdenum

Caterpillar D8 tractor working on a stubborn highway construction job.

A close-up view of alloying Molybdenum additions entering the molten metal.

PLANNED STRENGTH



A section of a Caterpillar foundry in operation, showing pouring chill test, temperature reading by optical pyrometer, alloy additions and taking a test of molten iron.

Acknowledged the world's largest earth-moving equipment manufacturer, Caterpillar Tractor Co. has long recognized the importance of MCA Molybdenum additions for strength and safety in castings for pistons, piston rings, crank shafts and cylinder heads.

In this 50th Anniversary Year of Caterpillar Tractor Co.'s manufacture of track-type tractors, it is significant that tough, slugging, punishing usage of equipment in the field is fully anticipated. To meet the rugged requirements of castings to stand up under the toughest duty, and come back for more, their destiny is shaped in the foundry where relatively small additions of MCA Molybdenum improve deep hardenability, eliminate temper brittleness, improve machineability, and upgrade other physical and metallurgical properties.

MCA Molybdenum has become the standard of comparison and the leader in its field, through constant technical research and application in the metallurgical industry.

As recognized authorities in the application of Molybdenum, Tungsten, Boron, Rare Earths, and the alloys and chemical elements of these materials, MCA assures confidential and immediate response to inquiries.

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Subsidiary: Cleveland-Tungsten, Inc.; Cleveland, Ohio *Plants:* Washington, Pa. and York, Pa.

MCA

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Announce Regional Programs

THE FIVE regional foundry conferences slated for the latter part of the year fall in October. They are: Michigan, October 14-15; Northwest, October 15-16; Metals Casting, October 28-29; All-Canadian, October 28-29; and New England, October 29-30.

Michigan Regional

Expansion of the casting market, improvement of casting quality, and reduction in casting cost through engineering will be the theme of the Michigan Regional Foundry Conference. Sponsored by the Central Michigan, Western Michigan, Detroit, Saginaw Valley, Michigan State College, and University of Michigan Chapters of AFS, in cooperation with the University of Michigan, the two-day conference will be held at the university in Ann Arbor, October 14 and 15.

Chairman of the Michigan Regional is Kenneth H. Priestley, Vassar Electroloy Co., Vassar, Mich. Program chairman is Woodrow W. Holden, Foundry Div., Eaton Mfg. Co., Vassar. Registration and part of the first day's sessions will be at Rackham Hall on the University of Michigan campus. Lunch on the 15th and the afternoon session that day will be in the U of M foundry. All other sessions and the conference dinner the evening of the 14th will be in the Michigan Union.

THURSDAY, OCTOBER 14

9:30 am . . REGISTRATION. Rackman Hall.
9:30 am . . CONFERENCE OPENING. Dean G. G. Brown, University of Michigan.
9:45 am . . *"Casting Horizons,"* Wm. G. Gude, *Foundry.*
11:00 am . . *"Risering"*
Steel . . J. B. Caine, Cincinnati.
Gray Iron . . to be announced.
12:30 pm . . LUNCHEON. *"The Future of Castings in the Automobile Industry,"* J. H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich.
2:00 pm . . *"Gating"*
Gray and Nodular Iron . . Carl B. Stone, Lynchburg Foundry Co., Lynchburg, Va.
Aluminum . . Harry Hillstrom, Aluminum Co. of America, Cleveland.
Magnesium . . H. E. Elliott, Dow Chemical Co., Bay City, Mich.
Malleable Iron . . C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill.
6:00 pm . . BANQUET AND ENTERTAINMENT. Speaker, Fred J. Walls, International Nickel Co., Detroit.

FRIDAY, OCTOBER 15

9:00 am . . *"Mold Production"*
Green Sand Pressure Molding . . John A. VanHaver, Sealed Power Corp., Muskegon Heights, Mich.
Shell . . Harold G. Sieggreen, Central Foundry Div., General Motors Corp., Saginaw, Mich.
Permanent Mold . . Howard U. McClelland, Foundry Div., Eaton Mfg. Co., Vassar, Mich.
12:00 noon . . LUNCH AND DEMONSTRATIONS. Experimental Foundry and Cast Metals Laboratory.
1:30 pm . . Review of Cast Metal Research at University of Michigan.
"Microbend Test—A New Tool For Evaluating Cast Metal Structure," P. K. Trojan.
"Dimensional Accuracy and Surface Quality in Shell Molded Castings," Floyd R. Smith.
"Graphitization in Magnesium-Treated Ferrous Materials," C. R. Hammond.
2:30 pm . . *"Careers in the Casting Industry,"* E. J. Walsh, Foundry Educational Foundation.

Northwest Regional

The Northwest Regional Foundry Conference will be held October 15 and 16 at Hotel Vancouver and the University of British Columbia (respectively), Vancouver, B. C. Staged in cooperation with the University of British Columbia, the conference is sponsored by the Oregon, Washington, British Columbia, and Oregon State College Chapters of AFS. Chairman of the conference is S. J. Hatchett, Canada Metal Co., Ltd., Vancouver.

A fashion show and luncheon are scheduled for the ladies on Saturday.

FRIDAY, OCTOBER 15

Afternoon . . REGISTRATION. Hotel Vancouver.
Evening . . BANQUET. Speaker: Dr. J. Parr, University of British Columbia.

SATURDAY, OCTOBER 16

Morning . . Steel: T. R. Stanley, Consolidated Mining & Smelting Co., Trail, B. C.
Iron . . J. E. Rehder, Canadian Iron Foundries, Montreal, Que.
Luncheon . . University of British Columbia.
Afternoon . . Brass: A. E. Cartwright, Crane Ltd., Montreal, Que.
Light Alloys: P. H. Hookings, Major Aluminum Products Ltd., Vancouver, B. C.
Evening . . DANCE. Stanley Park Sports Pavilion.

Metals Casting Conference

The Metals Casting Conference, to be held at Purdue University, West Lafayette, Ind., October 28 and 29, is sponsored by the Michiana and Central Indiana Chapters of AFS in cooperation with Purdue. General chairman is V. S. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind. All sessions will be held in the Purdue Union.

THURSDAY, OCTOBER 28

9:00 am . . REGISTRATION.
10:00 am . . Welcome. F. C. Hockema, vice-president and executive dean, Purdue.
Response: M. J. Lefler, Oliver Corp., South Bend, Ind.
"Properly Engineered Castings Will Save Your Customer Money," W. G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich.

First class was graduated this summer at the Foundrymen's Training Center at the Indian Institute of Technology, Kharagpur, India. Twenty foundrymen, most of them foremen, received three months of training under direction of John F. Schnur, foundry technologist, Armour Research Foundation of Illinois Institute of Technology, Chicago, shown (first row center) with his wife.

1:30 pm . . *"Good Pattern Design is Everybody's Business,"* Nelson Damm, Pyle Pattern Co., Muskegon, Mich.

3:00 pm . . *"Cost Savings Through Work Simplification,"* W. C. Cheek, Central Foundry Div., General Motors Corp., Danville, Ill.

6:30 pm . . BANQUET. Speaker: Ivan L. Willis, International Harvester Co., Chicago.

FRIDAY, OCTOBER 29

9:30 am . . *"Back Slagging and Hot Blast,"* Garnet P. Phillips, Manufacturing Research Div., International Harvester Co., Chicago.

"Front Slagging and Moisture Control," O. L. Wilhelm, Delco-Remy Div., General Motors Corp., Anderson, Ind.

11:15 am . . *"Automatic Moisture Control,"* W. E. Patterson, Elkhart Foundry & Machine Co., Elkhart, Ind.

1:30 pm . . *"Problems in the Cleaning Room,"* H. Graber, Studebaker Corp., South Bend, Ind.

3:00 pm . . Closing remarks: V. S. Spears, American Wheelabrator & Equipment Corp., Mishawaka, Ind., and Prof. C. T. Marek, Purdue University.

All-Canadian Conference

With "Foundrymen Forward with Canada" as a theme, the Fifth All-Canadian Foundry Conference will be held October 28 and 29 at the King Edward Hotel, Toronto, Ont. Room reservations should be made directly with the hotel. In addition to the technical sessions highlighted by a Cost and Quality Improvement School, three plants will be open for visits by conference attendants. Both days will end with a dinner meeting, human relations being the subject, the evening of the first day; Frank Leahy of football fame will speak at the banquet closing the conference. Alex Pirrie, Standard Sanitary & Dominion Radiator, Ltd., Toronto, is conference chairman.

THURSDAY, OCTOBER 28

8:00 am-5:00 pm . . REGISTRATION.

10:00 am-12:00 noon . . PLANT VISITS.

12:30 pm . . LUNCHEON.

2:00-5:00 pm . . COST AND QUALITY IMPROVEMENT SCHOOL. *"Foundry Fact Finding for Cost and Quality Improvement,"* D. L. Watson, Holmes Foundry Co. Ltd., Sarnia, Ont.

4:00-5:00 pm . . *"Pattern Engineering,"* E. T. Kindt, Kindt-Collins Co., Cleveland.

7:00 pm . . DINNER. *"Human Relations,"* A. Levenstein, Research Institute of America.

FRIDAY, OCTOBER 29

8:00 am-7:00 pm . . REGISTRATION.

9:00 am-12:00 noon . . COST AND QUALITY IMPROVEMENT SCHOOL. Panel Session: *"How We Improved Costs and Quality,"* J. P. Lubenkov, Link-Belt Ltd., Elmira, Ont.; A. Deacon, Cockshutt Farm Equipment Ltd., Brantford, Ont.; R. Gray, Canadian Westinghouse Co. Ltd., Hamilton, Ont.; J. E. Rehder, Canada Iron Foundries Ltd., Montreal, Que., and K. Blake, Fahralloy Canada Ltd., Orillia, Ont.

10:00 am . . PLANT VISITS.

2:00-4:00 pm . . *"Horizontal and Vertical Gating—Discussion and Practical Examples,"* AFS Research Films.

4:00-5:00 pm . . *"Pressure Molding,"* T. E. Barlow, Eastern Clay Products Dept., International Mineral & Chemical Corp., Chicago.

6:00-7:00 pm . . Reception.

7:00 pm . . BANQUET AND ENTERTAINMENT. Speaker: Frank Leahy.

New England Regional

The New England Regional Foundry Conference, sponsored by the New England Foundrymen's Association in cooperation with Massachusetts Institute of Technology, will be held in Building 10, MIT, Cambridge, Mass., October 29 and 30. Program consists of five ferrous, five non-ferrous, and two joint sessions, with a conference dinner (Faculty Club) the evening of October 29, and the annual smoker (Parker House, Boston) the following night.

Joseph B. Stazinski, General Electric Co., Everett, Mass., is conference chairman. Program chairmen are: ferrous—Ahti Erkkinen, B-I-F Industries, Inc., Providence, R. I.; non-ferrous—Stafford W. Chappell, Jr., General Dynamics Corp., Groton, Conn.

continued on page 74

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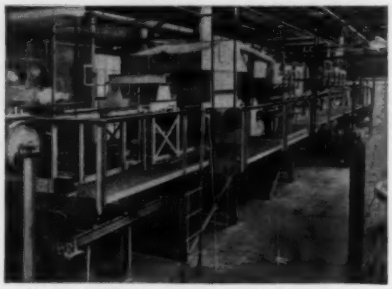

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Regionals

continued from page 73

FRIDAY, OCTOBER 29

9:00 am . . REGISTRATION OPENS.

9:45 am . . CONFERENCE OPENING. Joseph B. Stazinski. General Electric Co., Everett, Mass.

10:00 am . . ADDRESS OF WELCOME. Dean C. Richard Soderberg, MIT.

10:15 am . . FERROUS SESSION. *"Evaluation of Shell, D Process, and Pressure Molding,"* George J. Jackson, Walworth Co., South Boston, Mass., Harry W. Dietert, Harry W. Dietert Co., Detroit, and T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemicals Corp., Chicago.

NON-FERROUS SESSION. *"Brass and Bronze Foundry Practice for Pressure Castings,"* William Romanoff, H. Kramer & Co., Chicago.

1:30 pm . . JOINT SESSION. *"A Foundry Disease—Casting Defects?"* Clyde A. Sanders, American Colloid Co., Chicago.

3:00 pm . . FERROUS SESSION. *"Materials Handling,"* Lester B. Knight, Lester B. Knight & Associates, Inc., Chicago.

NON-FERROUS SESSION. *"Practical Aspects of Aluminum and Aluminum Alloys,"* Charles Batchelder, Charles Batchelder Co., Inc., Botsford, Conn.

6:30 pm . . CONFERENCE DINNER. Gerry Moore, sports writer, Boston Post.

SATURDAY, OCTOBER 30

8:00 am . . REGISTRATION OPENS.

9:00 am . . JOINT SESSION. *"Total Power,"* Kenneth G. Yost, National Metal Trades Association.

10:30 am . . FERROUS SESSION. *"Reducing Cleaning Costs in the Jobbing Foundry,"* Charles W. Mooney, Jr., Olney Foundry, Link-Belt Co., Philadelphia.

NON-FERROUS SESSION. *"Plaster Molding,"* Robert Megaw, U. S. Gypsum Co., Chicago.

1:30 pm . . *Ferrous Session. "Cupola Practice,"* Walter R. Jaeschke, Whiting Corp., Harvey, Ill.

NON-FERROUS SESSION. *"Melting Practice,"* Robert A. Colton, Federated Metals Div., American Smelting & Refining Co., Newark, N. J.

3:00 pm . . FERROUS SESSION. *"Casting Clinic,"* James S. Stringfellow, Draper Corp., Hopedale, Mass., Nick Nesbitt, Grinnell Corp., Providence, R. I., Lloyd E. Matteson. Jr., Narragansett Gray Iron Foundry Co., Providence, R. I.

NON-FERROUS SESSION. *"Casting Clinic,"* Fran Wolfer, American Hardware Co., New Britain, Conn., Robert Sheldon, Springfield Bronze & Aluminum Co., Springfield, Mass., Dan Sutherlan, Somerville Machine & Foundry Co., Somerville, Mass., and Ely Portman, Stillman White Foundry Co., Inc., Providence, R. I.

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Release NFA Program For Annual Meeting

Members of the National Foundry Association will meet October 7-8 at the LaSalle Hotel for the 56th annual meeting of the organization. Sessions scheduled will cover economic conditions, the 1954 Tax Reform Bill, labor agreements, a panel discussion by bargaining representatives, and a look at the future.

Officers will be installed late in the afternoon of the first day. A reception honoring NFA officials will follow.

Program for the meeting is:

THURSDAY, OCTOBER 7

10:00 am . . *Invocation.*
10:05 am . . *"Report of the President,"* Summerfield Brunk, Headford Brothers & Hitchins Foundry Co., Waterloo, Iowa.
10:15 am . . *"Working Analysis of the 1954 Tax Reform Bill and Its Effect on Industry,"* J. P. Goedert, American Institute of Accountants.
11:15 am . . *"Practical Program of Human Relations for Foundries,"* John Perry, Straus & Perry, Washington, D. C.
12:30 pm . . *Luncheon. "Governmental Affairs,"* U. S. Senator to be announced.
2:30 pm . . *"Current Economic Conditions and Industrial Activity,"* Leo Wolman, director, National Bureau of Economic Research.
3:30 pm . . *"Time Study and Incentive Clauses in Union Contracts,"* Phil Carroll, Maplewood, N. J.
4:15 pm . . *Report of Resolutions Committee. Installation of Officers.*
5:00 pm . . *Reception.*

FRIDAY, OCTOBER 8

9:54 am . . *Call to Order.*
10:00 am . . *Panel Discussion. "Collective Bargaining Problems, Programs, and Policies."* Medium Foundry — R. R. Washburn, Plainville Casting Co., Plainville, Conn.; Small Foundry—Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Inc., Indianapolis, Ind.; Large Foundry—Charles R. Appel, United States Pipe & Foundry Co.; Chattanooga, Tenn.; and Group —R. J. Redmond, Buckeye Foundry Co., Cincinnati, and president, Miami Valley Foundrymen's Association.
12:30 pm . . *Luncheon. "What the Future Holds for the Foundry Industry,"* George W. Cannon, Muskegon, Mich.

Safety Training Leaflets

National Safety Council is offering new employee training leaflets entitled "Accident Preventers." Using few words but plenty of colorful cartoons, the preventers teach safety to today's worker who is accustomed to the fast visual presentation of television and the picture magazines.

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Obituaries

Paul J. Jurack, 66, president-treasurer, Charles Jurack Co., Milwaukee, died in July. He became president of the firm in 1936 after the death of his father.

Ralph J. Fox, 54, treasurer, Dayton Malleable Iron Co., Dayton, Ohio, died recently.

Arthur L. Perlick, 57, secretary-treasurer, Perlick Brass Co., Milwaukee, died recently.

Joseph J. Fox, 62, sales representative, Wisconsin Steel Div., International Harvester Co., Chicago, died in July. He was with the firm for over 40 years.

Leland S. Hannold, sales manager, Royersford Foundry & Machine Co., Royersford, Pa., died recently.

Charles E. Andrews, 83, formerly New England manager and a director of Whitehead Brothers Co. of Providence died recently. He joined the Whitehead firm in 1904 as assistant to the New England manager and was appointed manager and director in 1924. He retired in 1946.

Robert Rullman, midwest district manager of the Patterson Foundry and Machine Co., East Liverpool, Ohio, died September 1. He was with the firm for 25 years.

Robert W. Lang, 67, recently retired vice-president of American Radiator and Standard Sanitary Corp. died August 29, at his home in Cleveland.

August E. Miller, 53, superintendent of the malleable foundry of International Harvester Co., Chicago, died in August, while on vacation in Florida.

Walter L. Patten, 65, vice-president and sales manager of Atlas Foundry Co., Cleveland, died in August.

James Mitchell, 71, former president of Cleveland Co-operative Stove Co., died in Cleveland in August.

Charles H. Stokesbury died at his home in Derby, Conn. in July. He was one of the original Board of Directors of the Non-Ferrous Founders' Society, Inc.

Elbert H. Bounds, 62, treasurer, Lufkin Foundry & Machine Co., Lufkin, Tex., died August 1. He was with the firm 35 years.

W. C. Wolf, superintendent, Iron Foundry, General Metals Corp., Oakland, Cal. died of a heart attack August 20. He was 39 years old and was with the firm since 1938.

Move NAM Office

Headquarters of the National Association of Manufacturers has been moved to 2 East 48th St., New York 17. Telephone number is MUrray Hill 8-4200. The public information staff is located in room 407.

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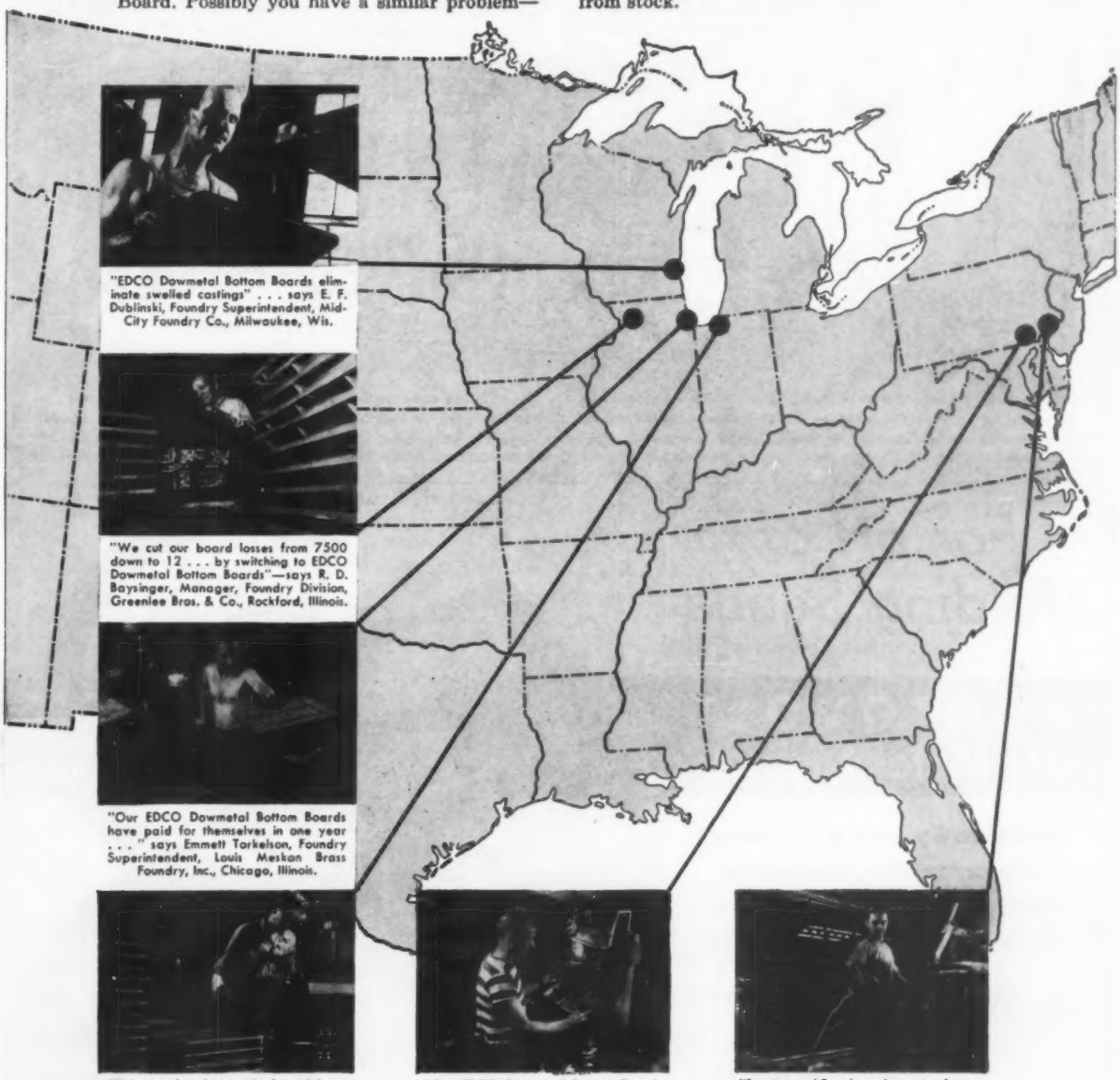

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"Our EDCO Dowmetal Bottom Boards have paid for themselves in one year . . ." says Emmett Torkelson, Foundry Superintendent, Louis Meskan Brass Foundry, Inc., Chicago, Illinois.

"Rejects reduced to an absolute minimum since using EDCO Dowmetal Bottom Boards" says Bob Petcher, Foundry Superintendent, Josam Mfg. Co., Michigan City, Ind.

"Our EDCO Dowmetal Bottom Boards Hold Up at High Temperatures . . ." says Robert H. Garrett, General Foreman, Lebanon Steel Foundry, Lebanon, Pennsylvania.

"Burning and Breakage loss not a factor since using EDCO Dowmetal Bottom Boards" . . . says Olney Foundry, Link-Belt Company, Philadelphia, Pa.

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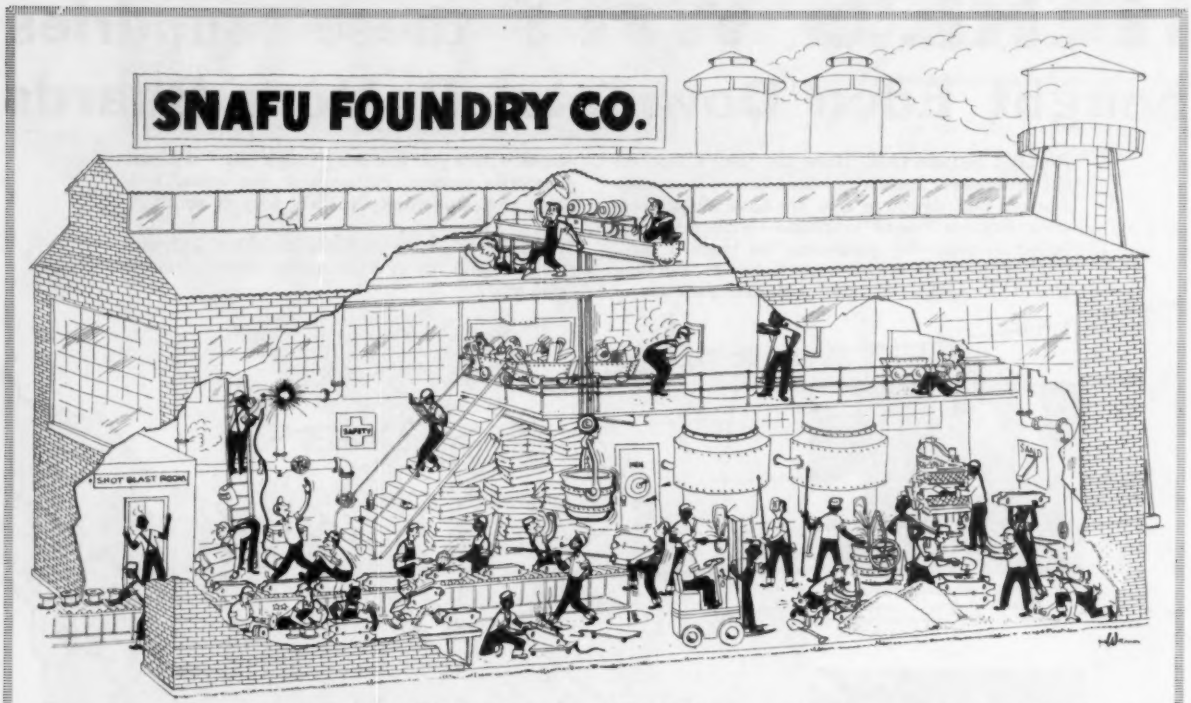

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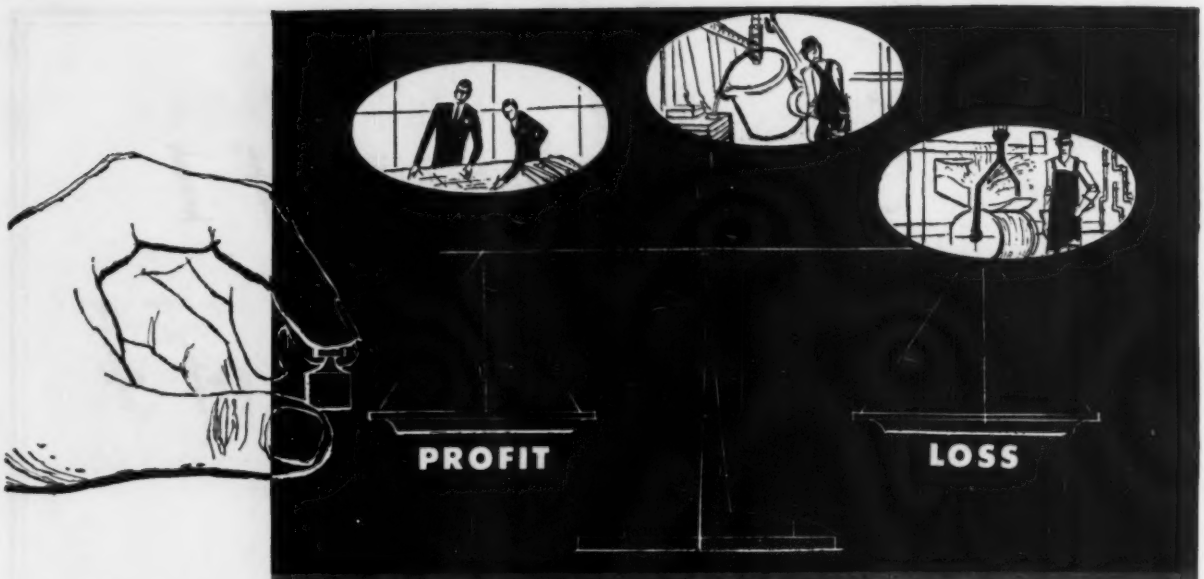

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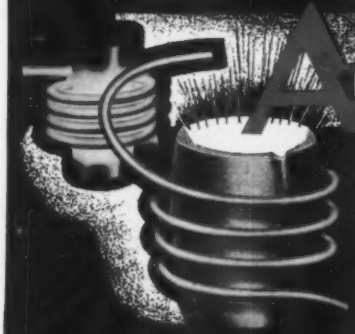
Ajax-Northrup converters are certified to meet F. C. C. regulations. Furnaces are available in sizes from 2 ozs. to 120 lbs. (For large production—Ajax-Northrup generator-operated furnaces.)

Write for Bulletin 14.



AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

AJAX ELECTROTHERMIC CORPORATION • TRENTON 5, NEW JERSEY

ASSOCIATED COMPANIES: AJAX ELECTRIC FURNACE CORPORATION • AJAX ELECTRIC COMPANY • AJAX ENGINEERING CORPORATION

Members and guests enjoying refreshments at the St. Louis Chapter's annual picnic held at Maple Grove, St. Louis County, in August.

Twin City Chapter Chairman, Arthur W. Johnson, Northern Malleable Iron Co., left, presenting the chapter golf trophy to Joseph S. Garske, right, Progress Pattern & Foundry Co., winner of the 1954 Twin City Golf Outing.

Chapter News

Philadelphia

Approximately 570 members and guests of the Philadelphia Chapter met in July at the Manufacturers Country Club, Philadelphia, to enjoy the chapter's annual picnic and outing. Festivities included a golf tournament and a softball game between the "Peddlers" and the "Founders" which ended in a tie. As a result of the tie game, players on both teams were awarded AFS "ties". Dinner and a floor show climaxed the outing.

—C. R. Sweeny.

Western Michigan

The 14th annual stag picnic sponsored by the Western Michigan Chapter was held at Pontaluna Golf Club, Muskegon, Mich., on August 14. Approximately 800 foundrymen and their guests took part in the day's activities consisting of a baseball game, horse shoe contests and golf. Several prizes donated by business organizations and foundry suppliers were awarded for contests and as attendance prizes. The picnic concluded with dinner, group singing, and a variety show.

—Wilson W. Hicks.

Southern California

Four hundred and sixty-five foundrymen turned out for the 17th annual summer picnic and show sponsored by the Southern California Chapter in August at the Lakewood Country Club, Long Beach, Calif.

Free refreshments were dispensed in the afternoon by Bill Baud and Ed Worth both of Mechanical Foundries Div., Food Machinery Co. In the horse shoe tournament, Frank Felix, Burke's Foundry and Joseph Valdes, Gregg Iron Foundry, won first and second prize respectively in the doubles, and Bill Cooper, Byron Jackson Co., finished first in the singles. First prize in the golf tournament was awarded to Don McLeod, Ohio Ferro-Alloys Corp. Ray Orr, Howell Foundry Co., Inc., served as entertainment chairman. The picnic was culminated by an evening dinner and a stage show.

—W. G. Stenberg.

Texas

The July meeting of the San Antonio section of the Texas Chapter, attended by approximately 43 members and guests, met at the Alamo Iron Works, San Antonio. Harold Judson, Kincaid-Osburn Electric Steel Co., reported on the progress of plans for the 1955 AFS Convention to be held in Houston, Texas, and stated that the San Antonio section has offered to assist in any practical way to make the Houston Convention a success.

Two films were presented at the meeting. A safety film, "Live in Darkness," was shown courtesy of the United States Air Force, and the second film, "Whirl Gates," was offered courtesy of the Steel Founders' Society of America.

After the meeting, refreshments were served sponsored by the Tex-Aloy Foundry Co., San Antonio.

—Edward W. Pruske.

St. Louis

More than 300 members and guests attended the annual picnic of the St. Louis Chapter held in August at Maple Grove, St. Louis County. Entertainment Chairman John O'Meara and his committee provided the group with abundant refreshments including a complete

continued on page 84

Fred Ridenour, Whiting Corp.

Group of Chicago Chapter members relaxing at the chapter's Stag Outing and Golf held in August at the Lincolnshire Country Club, Crete, Ill.

FEMA Annual Meeting

Annual meeting of the Foundry Equipment Manufacturers' Association will be held at The Greenbrier, White Sulphur Springs, W. Va., October 14-16. Featuring J. H. Smith, Central Foundry Div., General Motors Corp., Saginaw, Mich., as guest speaker at the general session the morning of October 16, the three-day meeting includes product group meetings all day the 14th, and general sessions the morning of the 15th and morning and afternoon of the 16th. The annual banquet, to be held the evening of October 15, will be preceded by a reception. A reception will also end the first day's activities.

Business sessions include committee reports, report on business conditions and rate of activity in the foundry equipment field, reports on activities of the National Castings Council and the Foundry Educational Foundation, and commentary on the "Washington scene."

Grinding Wheel Safety Film Available

"Play It Safe," 16-mm safety film produced by Peninsular Grinding Wheel Sales Corp. that drew full houses at the 1954 AFS Convention, explains how to avoid the four major causes of wheel breakage. The color-sound film received an award of merit at the Boston Film Festival June 2.

"Play It Safe" is available free of charge for showings wherever grinding wheels are used, and to foundry and safety associations. Write Department A, Peninsular Grinding Wheel Sales Corp., 729 Meldrum, Detroit 7, Mich.

Gray Iron Founders To Meet in November

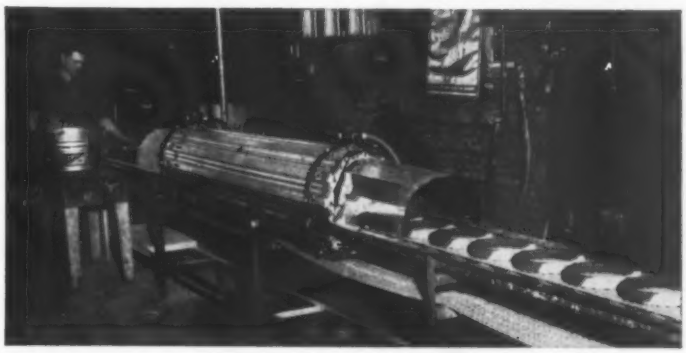
Gray Iron Founders' Society will hold its 26th annual meeting November 10-12 at The Homestead, Hot Springs, Va. Events the first day include a meeting of the retiring and the new board of directors in the morning, and a reception and dinner honoring the president in the evening.

Thursday, November 11, is a heavy day with reports of officers and program chairmen, a luncheon with Wendell B. Barnes, administrator, Small Business Administration, as speaker, and a business session on insurance. A banquet concludes the second day's activities. Friday, November 12, is devoted to talks on markets and increasing sales through product development. Also on the program is a talk by Paul W. Vanderburg, chief, Castings Sec., Business & Defense Service Administration. The GIFS annual meeting concludes with a luncheon at which new officers and directors will be introduced, and citations and awards will be made. Speaker will be Martin R. Gainsbrugh, chief economist, National Industrial Conference Board.

The fifth annual Dietert Sand School, held August 9, 10, and 11 in Detroit, was attended by 121 foundrymen. The Sand School, sponsored by the Harry W. Dietert Co., Detroit, covered the entire field of molding and core sand control, interpretation of test results, sand preparation, and elimination of casting defects due to sand conditions. As in the past, the classes were conducted by Frank Brewster, general manager, Harry W. Dietert Co.

Another CHROMALOX Production Tip

Core Drying Time Cut from 24 HOURS to 6 SECONDS!



PROBLEM

To speed up the drying of the dip-coat applied to cores for casting automotive parts. At least 24 hours drying time was needed under old method, and 6000 square feet of valuable floor area was used to store the cores while they air dried.

SOLUTION

The foundry installed a compact far-infrared core drying oven made of eleven 3.6 kilowatt all-metal Chromalox Electric Radiant Heaters. A 15-foot conveyor belt, variable in speed from zero to 10 feet-per-minute, moves cores through the oven at rate of 600 to 800 per hour. Cores are thoroughly dry in 6 seconds and ready for assembly.

ADVANTAGES

1—Drying time reduced from 24 hours to 6 seconds! 2—Existing core drying area including oven occupies only 200 square feet against 6000 square feet the old way. 3—Core surfaces are smooth and bubble-free with rejects practically eliminated.

CHROMALOX
Electric Heat for Modern Foundries

Want to know more about cutting costs with CHROMALOX heat?

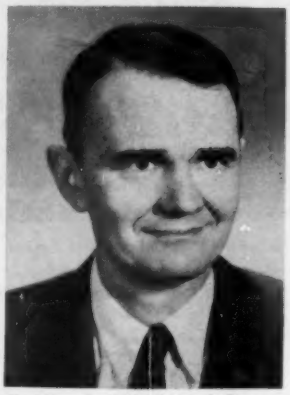
EDWIN L. WIEGAND COMPANY 58-32
7609 Thomas Blvd., Pittsburgh 8, Pa.
Send me more details on Chromalox Electric Heat for

☐ Shell molding ☐ Core drying
☐ Skin drying of molds ☐ Comfort heating

Name_____
Company_____
Street_____
City_____ Zone_____
State_____

For more data, circle No. 572 on postage-free Reader Service card, p. 17 or 18

Chapter Chairmen



Charles S. Chisolm, chairman, Tennessee Chapter, is superintendent of metallurgy and inspection at The Wheland Co., Chattanooga, Tenn. Mr. Chisolm was educated at Alabama Polytechnic Institute where he earned his B.S. degree in 1938 and his M.S. degree in 1939. Before joining The Wheland Co. in 1946, he was employed for two years by the Tennessee Coal & Iron Co., Birmingham, Ala. Mr. Chisolm is a member of the American Society for Testing Materials and is a past chairman of the Chattanooga Chapter of the A.S.M.

Woodrow W. Holden, chairman, Saginaw Valley Chapter, is chief metallurgist, Foundry Div., Eaton Mfg. Co., Vassar, Mich. Before joining Eaton, he was employed by the General Foundry & Mfg. Co., Flint, Mich., starting as a chemist and advancing to chief metallurgist. Active in AFS committee work, Mr. Holden is a member of the Gray Iron Shop Course Sub-Committee, the Chill Test Committee, and is program chairman for the 1954 Michigan Regional Foundry Conference. He is also a member of the Cupola Research Committee of the Gray Iron Research Institute.

Retiring chairman of the Texas Chapter, Israel Smith, Western Foundry Co., right, turning gavel over to new chairman, Edward W. Wey, Dee Brass Foundry.

Chapter News

continued from page 82

picnic barbecue, and organized softball and corkball games, and a horse shoe tournament. Highlight of the picnic was the awarding of attendance prizes donated by local suppliers.

—J. R. Bodine, Jr.

Twin City

The annual golf outing and dinner of the Twin City Chapter, held in August at the Midland Hills Country Club, St. Paul, drew a record attendance of 250 members and guests. J. S. Garske, Progress Pattern and Foundry Co., St. Paul, who directed the outing, won first place in the annual golf tournament, and was awarded the chapter trophy. The outing concluded with the awarding of attendance prizes and dinner.

—R. J. Mulligan.

Washington

Approximately 150 Washington Chapter foundrymen and their families turned out for the chapter's annual summer outing held August 21 at Five-Mile Lake. Activities included boating and swimming, an egg throwing contest, and special games for the ladies. Children were furnished with tickets which entitled them to all the pop, candy, and popcorn they could eat.—*Fred R. Young.*

Ladies attending the Washington Chapter's annual summer outing participating in a nail driving contest.

Chapter Chairmen

Roy A. Payne, plant manager, Sterling Brass Foundry, is current chairman of the Michiana Chapter. He was active in several fields before entering the foundry industry in 1936, when he joined Sterling Brass. Born in Boston, Mr. Payne began his business career with the Boston & Albany Railroad, where he was employed for one year. His employment background also includes two years with General American Tank Car Corp., Elkhart, Ind. He is a past national AFS director, and served one term as chairman of the AFS Entertainment Committee.

Charles R. Gregg, 1954-55 chairman of the Southern California Chapter, is president of Gregg Iron Foundry, El Monte, Calif. A graduate of the University of California in 1934, Mr. Gregg began his foundry career while still attending the university as an apprentice with the Reliance Regulator Corp., Alhambra, Calif. In 1942 he advanced to superintendent of Reliance Regulator, and in 1947 joined Gregg Iron Foundry as president and general manager.

In addition to his activities in AFS, Mr. Gregg is also a member of the A.S.M.

Have you a skeleton in your blast cleaning closet?

● How is your abrasive consumption? And what is maintenance costing you on your blast cleaning equipment?

If these two items constitute a skeleton in your blast cleaning closet it is time you heard the story of Controlled T chilled iron shot and grit.

Not only do you get rid of skeletons, but "Controlled T" *guarantees* you a 15% saving on your blast cleaning costs *regardless* of the price you may now be paying for chilled iron shot! The money you save on maintenance—on top of this—is all gravy for you—an extra dividend.

Get in touch with the Hickman, Williams office nearest you and ask for a free copy of "A Primer on the use of shot and grit."

NATIONAL CONTROLLED "T" SHOT AND GRIT IS PRODUCED EXCLUSIVELY BY

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THE NATIONAL METAL ABRASIVE CO.
Cleveland, Ohio

WESTERN METAL ABRASIVES CO.
Chicago Heights, Illinois

AND SOLD EXCLUSIVELY BY

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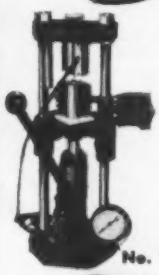
For more data, circle No. 573, p. 17-18

Buehler

Testing Equipment for the Foundry



No. 1315

Here are a few items selected from the complete Buehler line of metallurgical equipment. Write for new catalogue which describes and illustrates over 200 pieces of equipment.

No. 1500

No. 1315 AB SPECIMEN MOUNT PRESS, complete with ejector, 10,000-lb. hydraulic gauge, 1" mold, heater and cooler.....**$190.00**

No. 1500 AB STANDARD POLISHER with 8" polishing wheel, cover, removable hand rest and splash ring. Motor and two-speed switch. **$185.00**

No. 2790

No. 2790 GC COMBINATION SAND RAMMER-COMPRESSION TESTER with loading device, pressure gauge, sand container and stripping post, on pedestal.....**$245.00**

No. 2230

No. 2230 B & L WIDE FIELD MICROSCOPE SKW-5 with triple sliding nosepiece, 3 paired objectives 0.66x, 1.33x and 3x, 2 sets paired wide field eyepieces 10x and 15x **$426.00**

No. 2715

No. 2715 PITTSBURGH BRINELL MACHINE Style A, hand operated, for 3000 Kg. load.....**$395.00**

No. 2772 UNIVERSAL SAND STRENGTH MACHINE, hand operated, A.F.A. specifications. Equipped for green and dry compression test of molding sand.....**$229.00**

No. 2772

THE BUEHLER LINE OF SPECIMEN PREPARATION EQUIPMENT INCLUDES—CUT-OFF MACHINES • SPECIMEN MOUNT PRESSES • POWER GRINDERS • EMERY PAPER GRINDERS • HAND GRINDERS • BELT SURFACERS • POLISHERS • POLISHING CLOTHS • POLISHING ABRASIVES

Buehler Ltd.

METALLURGICAL APPARATUS
2120 Greenwood Avenue, Evanston, Illinois

For more data, circle No. 574, p. 17-18

DAVENPORT'S

progressive molding

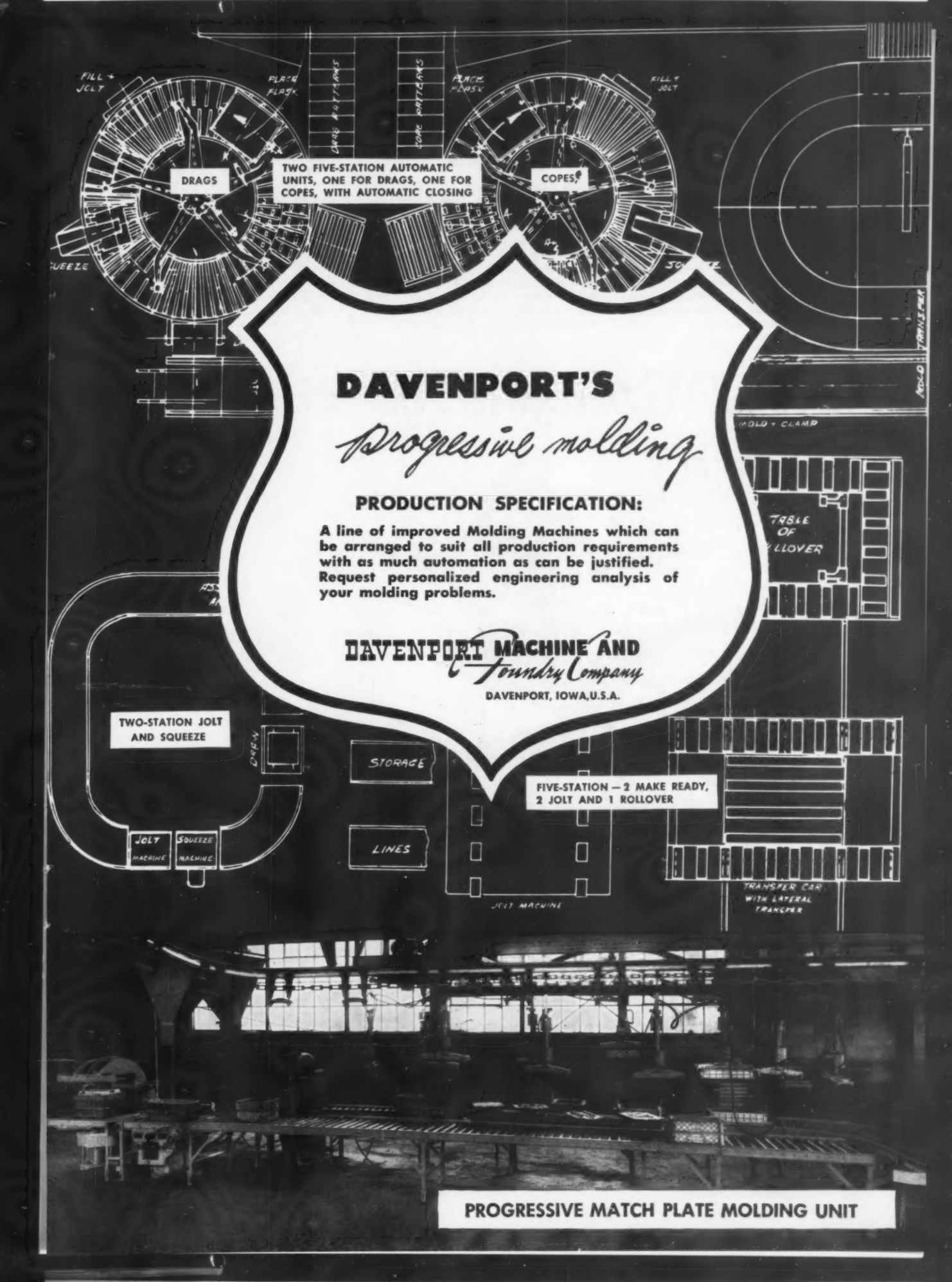
FLEXIBLE APPLICATION:

Puts short runs on production basis.
Makes drags and copes on one unit or separate units in either tight or removable flasks.
Makes molds from match plates mechanically without limitation in size.
Hydraulic squeezing for "Pressure Molding."

DAVENPORT MACHINE AND *Foundry Company*

DAVENPORT, IOWA, U.S.A.

PROGRESSIVE MATCH PLATE MOLDING UNIT


DRAGS
TWO FIVE-STATION AUTOMATIC UNITS, ONE FOR DRAGS, ONE FOR COPES, WITH AUTOMATIC CLOSING
COPES
DAVENPORT'S
progressive molding
PRODUCTION SPECIFICATION:
A line of improved Molding Machines which can be arranged to suit all production requirements with as much automation as can be justified. Request personalized engineering analysis of your molding problems.
DAVENPORT MACHINE AND Foundry Company
DAVENPORT, IOWA, U.S.A.
TWO-STATION JOLT AND SQUEEZE
STORAGE
LINES
FIVE-STATION — 2 MAKE READY, 2 JOLT AND 1 ROLLOVER
JOLT MACHINE
SQUEEZE MACHINE
TRANSFER CAR WITH LATERAL TRANSFER
PROGRESSIVE MATCH PLATE MOLDING UNIT

Issue Research Booklet

A 14-page brochure summarizing facilities available for metals research has been published by Armour Research Foundation of Illinois Institute of Technology, Chicago. The brochure describes the personnel, their experience, and the services offered by the metals research department's staff of 115 technicians, engineers, and scientists. The publication outlines the facilities available in the fields of powder metallurgy, applied metallurgy, electro-chemistry, extraction metallurgy, foundry and steel making, mechanical metallurgy, nonferrous metallurgy, physical metallurgy, metalography, and welding.

Free copies may be obtained from the Metals Research Dept., Armour Research Foundation of Illinois Institute of Technology, 3350 S. Federal St., Chicago 16.

Changes Name

The Industrial Furnace Manufacturers Association, Inc. has changed its name to Industrial Heating Equipment Association, Inc., according to Carl L. Ipsen, executive vice-president. Both the name and character of the 25-year-old association are changed, Ipsen said, as membership is broadened to include induction and dielectric heating equipment, ovens, and combustion equipment as well as industrial furnaces.

CASTING through the Ages

WAR and PEACE KEPT MEDIAEVAL FOUNDERS EQUALLY BUSY. DURING WAR THEY MOLDED CANNON FROM MELTED-DOWN BELL METAL; IN PEACE TIME THEY CAST CANNON METAL BACK INTO BELLS AGAIN!
FROM EARLIEST TIMES, THE IRISH FOUNDRYMAN WAS SO HIGHLY REGARDED THAT HE WAS DEEMED WORTHY TO RANK WITH THE NOBLES.
In Colonial New England DAYS, IT SEEMS, CASTERS OF POTS, KETTLES AND OTHER HOUSEHOLD UTENSILS FREQUENTLY RECEIVED THEIR PAY FROM STOREKEEPERS IN RUM, MOLASSES, FISH, AND OTHER COMMODITIES.
Odd Bits
AS EARLY AS 1722 — FRANCE'S FAMED SCIENTIST, REAUMUR, MELTED IRON IN SMALL HAND-BELLOWS-OPERATED PORTABLE CUPOLAS, ABOUT 24" HIGH BY 9" IN DIAMETER!

FEMA Moves Hq. to Washington, D. C.

Headquarters of the Foundry Equipment Manufacturers Association, Inc., has been moved to Washington, D. C., it has been announced by W. B. Wallis, president of the association. At the same time he announced the appointment of C. R. Heller as executive secretary-treasurer of the organization, who will head the new office at No. 1 Thomas Circle.

Mr. Heller has long been associated with the foundry industry. He was with Jeffery Manufacturing Co. for 30 years, rising to vice-president. During World War II he served for five years on the War Production Board as head of Materials Handling Equipment Branch and for the past seven years he has been manager of the Washington, D. C. office of Link-Belt Co.

C. R. Heller

He succeeds Arthur J. Tuscany, Jr., who will remain in Cleveland. Mr. Tuscany became executive secretary of the organization upon the death of his father, Arthur Tuscany, Sr., who held the position for the past 17 years.

By moving F.E.M.A. headquarters to Washington, it was pointed out, the organization will be closer to the scene on matters concerning the national government.

The association is made up of 61 companies who are major suppliers of equipment to the foundry industry. It was organized in 1919 and until this change had headquarters in Cleveland. Besides serving as spokesman for member companies, F.E.M.A. encourages research, disseminates trade information, and in general promotes cooperation between foundry equipment manufacturers and the foundry industry.

Scholarships Offered

Sixty-four scholarships valued at more than $15,000 will be awarded by International Correspondence Schools to persons unable to attend college. The awards, to be made in 1954, will go to young men and women in the U.S. and Canada.

Meters by the millions...

from metal melted by

6 DETROIT ROCKING ELECTRIC FURNACES

Recently, the 11,500,000th Neptune meter was produced. This, like the bronze-cased Neptune meters for 30 years, was made from metals melted in a Detroit Rocking Electric Furnace.

The six DEF Furnaces in Neptune Meter Company's foundry are under constant pressure to meet production demands which call for hundreds of tons of melt per month. To meet quality standards, melts must be uniform, of exact analysis, and produced with economy and speed.

The indirect arc and controlled rocking action of Detroit Furnaces bring important advantages to production of both non-ferrous and ferrous melts. To learn how these advantages can benefit *your* foundry operations, let our engineers analyze your melting requirements. Write today!

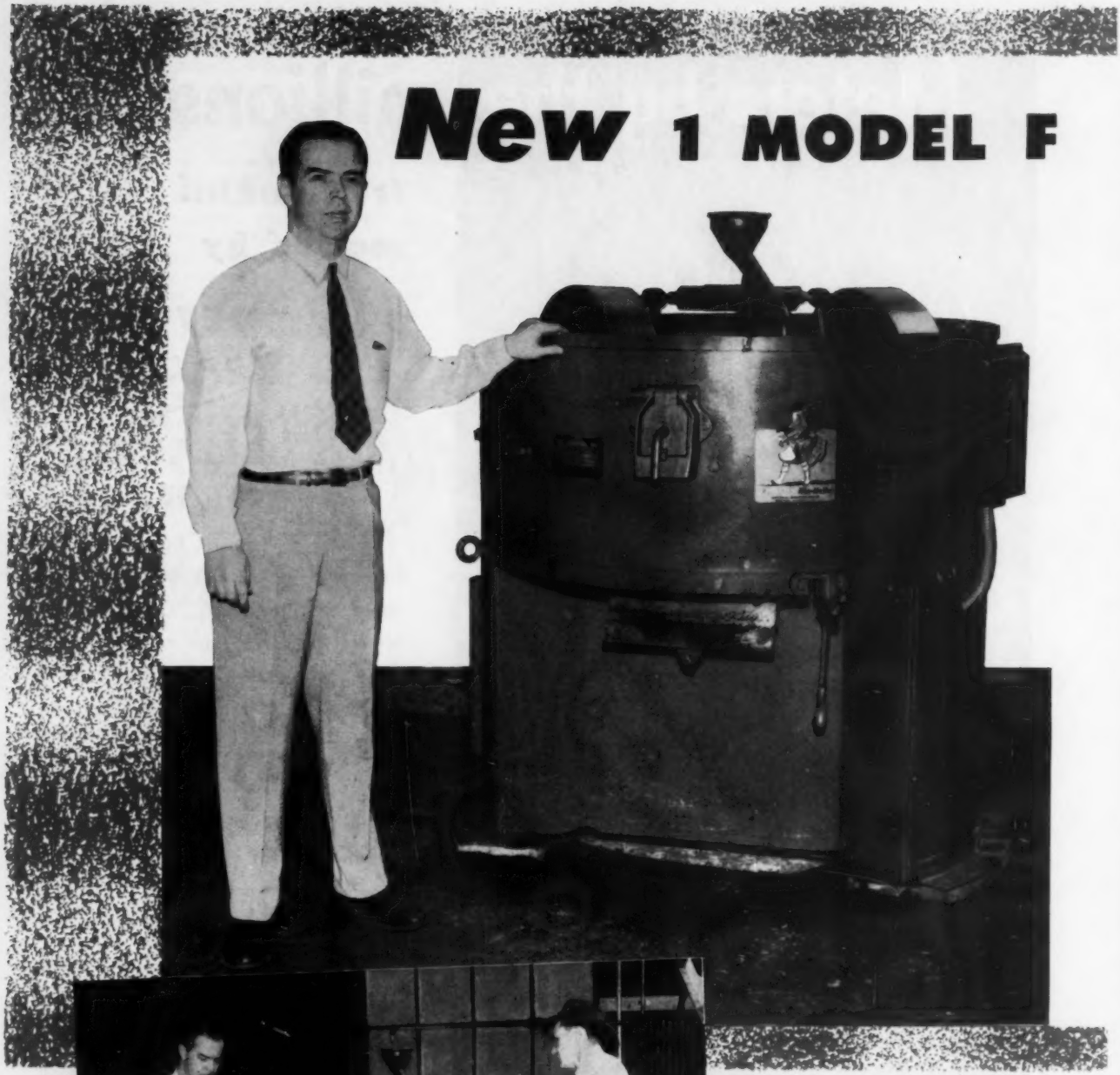
DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICH.

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N.Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

MEMBER FEMA

New 1 MODEL F



● Photos show Mr. T. E. Huston (left), Vice-President of Xenia Foundry & Machine Co. with their new No. 1 Model F Mix-Muller. Note convenient discharge mechanism and sturdy, safe sand sampler.

"Big capacity and positive mulling have reduced sand preparation time by 30%. New Simpson has eliminated facing down time and has consistently improved castings' finish," says Mr. Huston.

For more data, circle No. 577 on postage-free Reader Service card on p. 17 or 18

MIX-MULLER CUTS MULLING TIME BY 30%!

Here's an interesting report from XENIA FOUNDRY & MACHINE COMPANY, Xenia, Ohio . . . on some "gratifying gains" realized after only 6 weeks' use of their new Simpson Mix-Muller.

One of our first customers for the new No. 1 Model F Mix-Muller was W. M. Huston, President of Xenia Foundry. Mr. Huston was impressed by the compact design of the new unit . . . and its apparent suitability for his needs in producing small and medium size gray iron castings. Mr. Huston wrote us only 6 *weeks* after the No. 1F was installed—reporting "excellent results" and some "particularly gratifying gains":

"Our whole mulling cycle has been cut about 30%, due to the increased capacity and the reduced mulling time. Facing down time has been entirely eliminated."

"By having a well mulled facing sand, we have been able to produce a much better casting finish. This gain has extended to our cleaning room, and an appreciable savings in cleaning time and supplies."

"Needless to say, your 1-F Simpson Mixer has corrected basic problems. We would highly recommend this unit to foundries of our size and type."

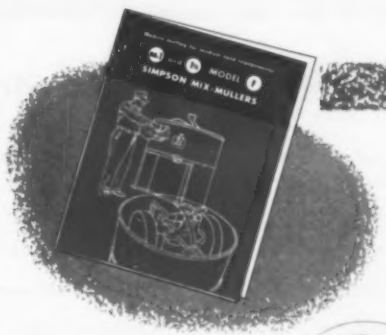
Xenia Foundry & Machine Company is just one of many progressive foundries that are daily realizing that the new F Series Simpson Mix-Mullers are the *modern* way of preparing sand . . . and are essential to present day molding practice.

There is a Simpson Mix-Muller for *every* batch capacity requirement: 50 • 250 • 500 • 1000 • 1500 • 2000 • 3000 and 4000 pounds. YOUR requirements are included—so why not write for further details? State your needs and let a National foundry engineer show you how you can attain more positive mulling for *your* money with a Simpson Mix-Muller.

WRITE FOR BULLETIN 520

This new bulletin gives details on two new Mix-Mullers—the No. 1 F and the No. 1½ F. Designed for medium capacity needs of 500 lbs. and 1000 lbs. respectively, here are a few of the plus features offered at no extra cost:

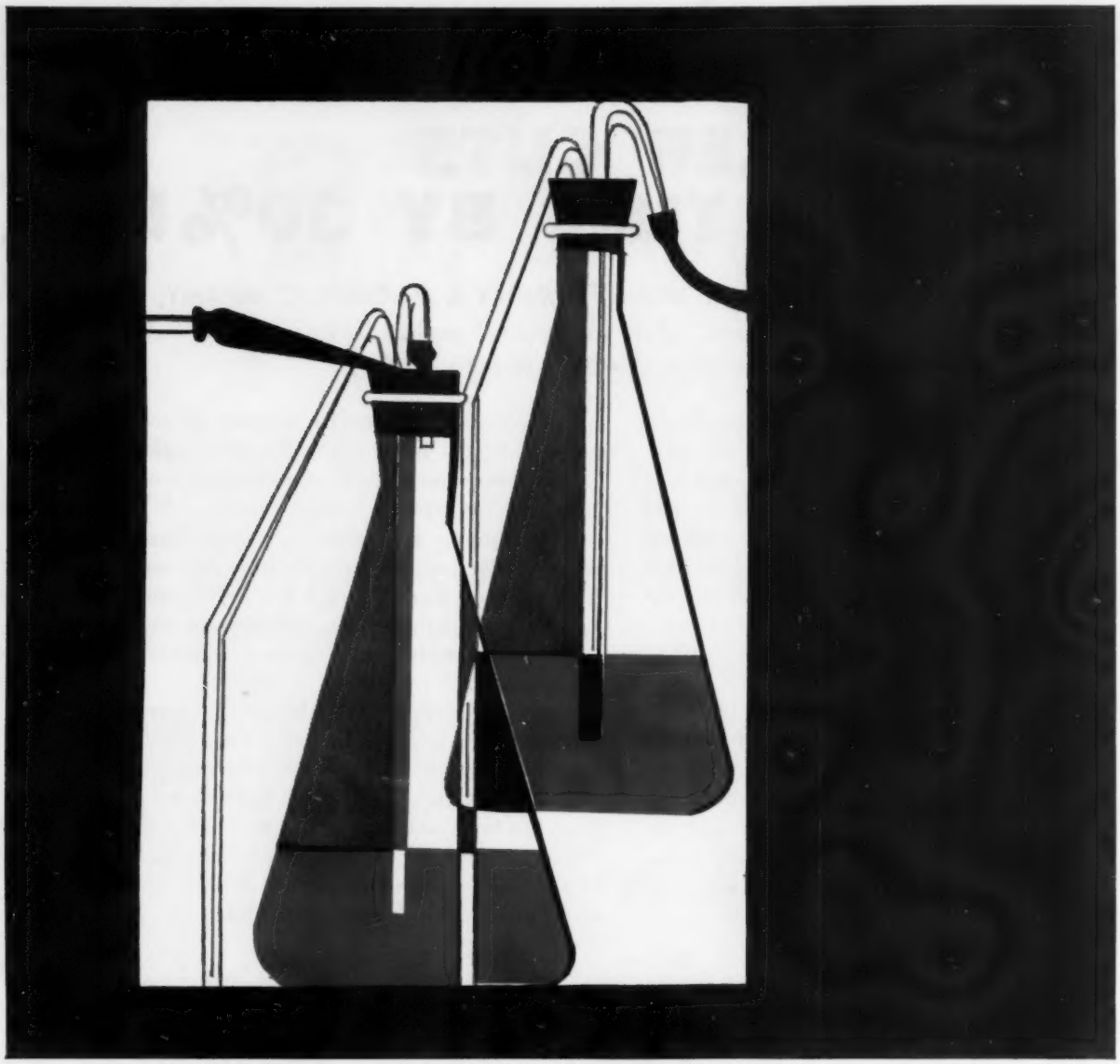
CRIB SCRAPERS • CENTRAL LIQUID ADDITIONS FUNNEL • V-BELT UNIT DRIVE • SPRING LOADED MULLERS • ANTI-FRICTION BEARINGS THROUGHOUT



National Engineering Company
(Not Inc.)
630 Machinery Hall Bldg. • Chicago 6, Illinois

NATIONAL SAND PREPARING & MOLD HANDLING SYSTEMS

SIMPSON *Intensive* MIX-MULLERS



In making a casting specify PENOLYN CORE OIL

for assured high efficiency

Penolyn Core Oil offers all of these important features for full efficiency

- Uniformity
- Concentrated form
- No obnoxious odor
- No seepage
- No crusting or green mix
- Clean working
- Wide temperature range
- Polymerized formulation
- Minimum gas
- Ample collapsibility

FOR MAXIMUM FOUNDRY EFFICIENCY—always be sure to specify PENOLYN CORE OIL. There's a grade of Penolyn to meet the most exacting requirements of every Foundry and Core Room Practice.

FOR EXPERT TECHNICAL ASSISTANCE—always be sure to call the Penola Office nearest to you for any technical data or assistance regarding *your* casting operations.

PENOLA OIL COMPANY · NEW YORK · DETROIT · CHICAGO

Penola

For more data, circle No. 578 on postage-free Reader Service card on p. 17 or 18

can you match this Ability with any one machine?

Ability to dig The Allis-Chalmers HD-5G Tractor Shovel is not merely a loader. It is a powerful excavator. It can dig into clay, break up and load hard-packed bulk chemicals. Bucket teeth and rear-mounted hydraulic ripper attachments are available to speed tough excavating jobs.

Ability to load fast With its big 1¼-cu-yd bucket — and the power to crowd it full — the HD-5G keeps loading and stockpiling jobs moving at peak production. Two-yard light materials bucket is available for snow, coal, and other light materials.

Ability to maneuver—in close quarters. It takes a crawler tractor to utilize such power and capacity in such a small space. The HD-5G pivots around within its own track length. Special high-speed reverse adds further to output on short-cycle jobs.

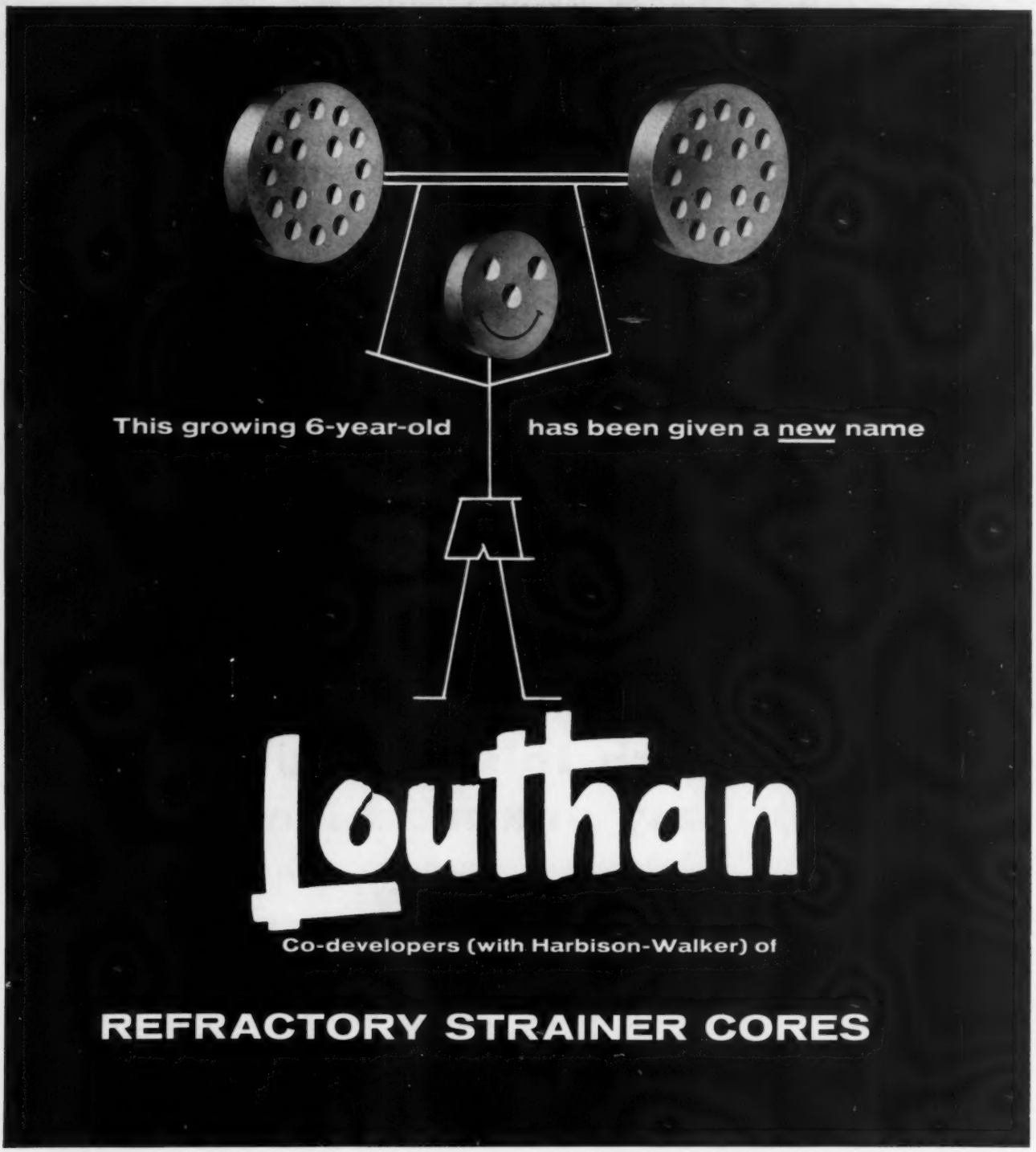
Ability to handle any load A wide variety of front-end attachments may be quickly interchanged with the standard bucket. Included are Lift Fork for packaged and palletized loads, Bulldozer for stripping and stockpiling, Crane Hooks for machinery and other heavy, solid objects, special Rock Buckets and Rock Forks. Drawbar is always available for heavy hauling jobs.

Ability to work anywhere any time The HD-5G has stability to work safely over rutted or uneven ground . . . traction and flotation to travel through snow, mud, sand where rubber-tired equipment cannot operate. It is the ideal machine both for materials handling and yard maintenance jobs.

Write for literature or ask your Allis-Chalmers dealer to tell you more about the versatility and flexibility of the HD-5G. Let him show you how its ability to switch from job to job — and to do each one well —can save you time, labor and specialized equipment.

For more data, circle No. 579 on postage-free Reader Service card on p. 17 or 18

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



REPRESENTATIVES: **FREDERIC B. STEVENS, INC.,** 1800 18th St., DETROIT, MICH.; 17 N. Glenwood Ave., ALDEN, PA.; 4036 Belle Grove Rd., BALTIMORE 25, MD.; 93 Stone St., BUFFALO 12, N. Y.; 6441 N. Seeley, CHICAGO 45, ILL.; 1940 E. 6th St., CLEVELAND, OHIO; 3367A Broadmoor, COLUMBUS 13, OHIO; 1504 Lawndale Rd., ELKHART, IND.; 654 W. 8th St., ERIE, PA.; 434 Delia St., FLINT, MICH.; P. O. Box 154, FRAMINGHAM CENTER, MASS.; 149 Euclid, HAMBURG, N. Y.; P. O. Box 243, HAMILTON, OHIO; 4000 E. 16th St., INDIANAPOLIS, IND.; 519 71st St., KENOSHA, WISC.; 168 Brewery St., NEW HAVEN, CONN.; P. O. Box 894, PEORIA, ILL.; 625 W. Huron St., PONTIAC, MICH.; 141 Harvest Dr., ROCHESTER 13, N. Y.; 257 Dayton Rd., TRUMBULL, CONN. . . . **MISSOURI REFRACTORIES CO.,** 4599 Pacific Blvd., LOS ANGELES 58, CALIF. . . . **FOUNDRY SUPPLY CO.,** 5009 Excelsior Blvd., MINNEAPOLIS 16, MINN. ***IN CANADA:*** **FREDERIC B. STEVENS OF CANADA, LTD.,** 41 Dovercourt, TORONTO 1, ONT.; 1262 McDougall St., WINDSOR, ONT.

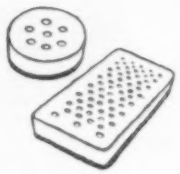
For more data, circle No. 580 on postage-free Reader Service card on p. 17 or 18

Facts you should know about

LOUTHAN REFRACTORY STRAINER CORES

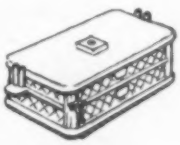
The product

Louthan perfected and made the *first* successful refractory strainer cores. While marketed up to now by Harbison-Walker, all have been *made by Louthan*, a former subsidiary of "H-W". All Louthan Cores are made of a high-strength ceramic material having a low thermal expansion. All are precision formed and kiln fired. All are *guaranteed* to withstand pouring temperatures up to 3,000° F. without spalling or eroding—a great help in producing better, cleaner castings at lower costs.



Its uses and advantages

Used by leading foundries in the making of *nearly ten million* castings last year, Louthan Refractory Strainer Cores pay for themselves many times over. Easily inserted in the drag, they closely control the flow of metal, keep slag and sand-core inclusions out of castings, save needless grinding and rejects, permit users to work to closer tolerances, often eliminate the need of costly gating systems.



Performance standards; sizes and shapes

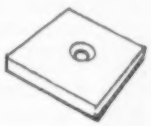
High in thermal shock resistance (*will withstand immersion in 3,000 degree molten steel for 25 seconds without spalling or disintegrating*). Louthan Cores are exceptionally uniform, dimensionally accurate, no flash in openings, easy to handle and use. Available in seven standard sizes (ranging from 1¾″ to 3½″ in diameter), also in special sizes and shapes to meet your specific requirements.

Sales representation

Louthan Strainer Cores will be distributed and sold by leading *foundry supply houses* exclusively. Their knowledge of your business should be helpful in your making the best use of these refractory strainer cores. These jobbers will also carry stocks for your added convenience.

Louthan Refractory Breaker Cores

A joint development of Louthan, H-W and the Steel Founders Society, these breaker core shapes are saving time and money for a growing number of steel casting producers. Scientifically designed for just the right amount of heat conductivity needed for perfect castings. Available in a wide range of sizes.



TEST LOUTHAN CORES IN YOUR OWN FOUNDRY!

See your nearest Jobber or write us for free samples!

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THE LOUTHAN MFG. CO.

(Subsidiary of Ferro Corporation) East Liverpool, Ohio

for cooling • drying • exhausting • fume dispersal • heat transfer

Easily-installed units for high-efficiency air movement in all duct systems. Direct-driven types for atmospheres within safe motor operating limits or belted models for hazardous fumes, vapors and excessive temperatures. Sizes 12" to 84" with 2, 4, 6, or 7 blades. Capacities to 120,000 C.F.M.

other models for every air-moving requirement

All Aerovent Fans are rated in accordance with the Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

Ask for free folder D-50!

Aerovent Fan Company, Inc.
Ash and Burch Streets Piqua, Ohio

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For Top Quality Castings—

—specify Top Quality Foundry Materials

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Portage (Wis.) Silica
Century Molding
*Ottawa Blackhawk Silica
Muskegon Lakesand
Tenn. & Ind. Molding
Utica Crude Silica
Silko Molding
*Zircon Sand, Flour and Wash
Berlin Coresand
Red Flint Annealing
New Jersey Molding
Gallia Red Molding
Albany Molding

BONDING CLAYS
*Volclay, MX-80 (Granular)
*and Panther Creek Bentonite
*Goose Lake Fire Clay
*Grundite Bonding Clay

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Tru-Steel Steel Shot
*Certified Shot and Grit
*Malleabrasive Shot and Grit
*Blackhawk Sand Blast Sand
*Super-Titan Nozzles

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Any Ideas?

A list of 200 technical problems confronting the armed services has been compiled as a means of enlisting the aid of industry, science, and the individual inventor in the country's defense effort. Compiled by the National Inventors Council with the aid of the three military services, the list is available free of charge from National Inventors Council, U.S. Department of Commerce, Office of Technical Services, Washington, D.C.

Among the needs are: protective coating for magnesium subject to marine environments, particularly in vicinity of dissimilar metal contacts; easily-worked alloy which will withstand 5000 F and above; low friction bushing material; means of sealing cracks in cast iron without heat and expansion associated with welding.

Others include: light alloys that retain strength at up to 1000 F; light casting alloys (75,000 psi yield) that can be cast to shape and heat treated; non-corroding, penetrating, alloying treatment of magnesium; method of applying metallic films to magnesium to obtain lightness with resistance to corrosion and wear.

Help Small Business

Small business is getting more help in the prevention of employee injuries. The National Safety Council's Small Business Program, which was put on a full-time basis in 1951, has been ensured of continued progress through the increase of its grant from the National Association of Mutual Casualty Companies to $24,000. The added funds will enable the program to extend more help to associations, local safety councils and other business groups.

As part of this program, National Safety Council is offering a new booklet entitled "Plus Cost." The booklet tells how accidents nibble at profits and outlines the "why" and "how" of accident control. Intended specifically for small firms with relatively few employees and no safety staff, "Plus Cost" sets down seven easy steps for eliminating accidents.

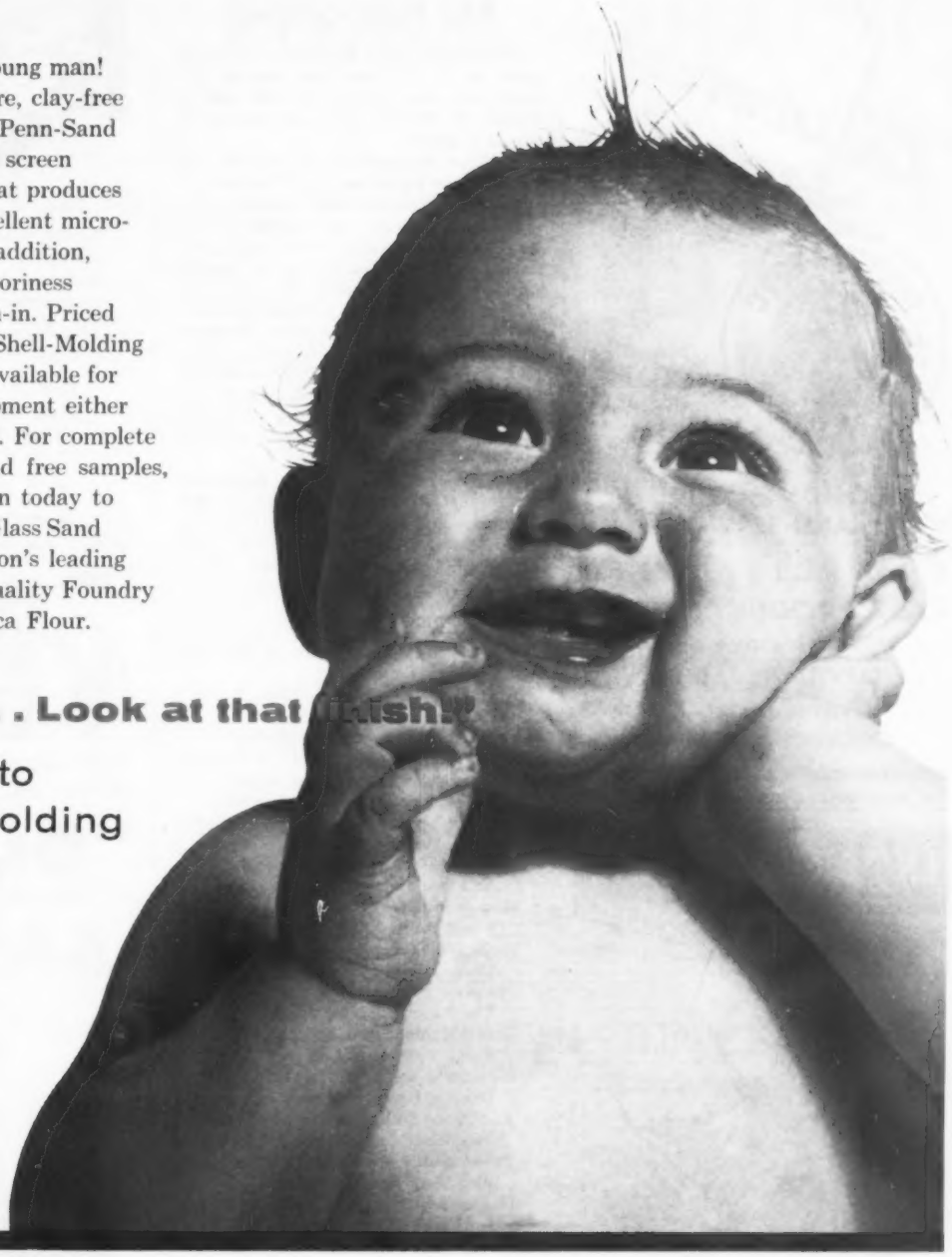
Single copies of the eight-page booklet, illustrated with two-color drawings, may be obtained by writing the Small Business Program, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

Offer Shell Molding Film

"Shell Molding and You," a new 25-minute sound-slide film designed to acquaint foundrymen and buyers of foundry products with the latest benefits of this new casting process, is available for showings from the Chemical Materials Department of General Electric Co.

The 35-mm color film describes the advantages of shell molding, and shows a step-by-step demonstration of shell molding operations at G. E.

You said it, young man! Chemically pure, clay-free Shell-Molding Penn-Sand offers the right screen distribution that produces castings of excellent micro-inch finish. In addition, its high refractoriness minimizes burn-in. Priced economically, Shell-Molding Penn-Sand is available for immediate shipment either bulk or bagged. For complete information and free samples, mail the coupon today to Pennsylvania Glass Sand Corp., the nation's leading producers of Quality Foundry Sands and Silica Flour.



"WOW . . . Look at that finish!"

Thanks to
Shell-Molding
PENN-SAND

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THE SURE START TO A PERFECT FINISH

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Two Gateway Center, Pittsburgh, Pa.

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☐ Molding Sand ☐ Core Sand ☐ Sandblast Sand
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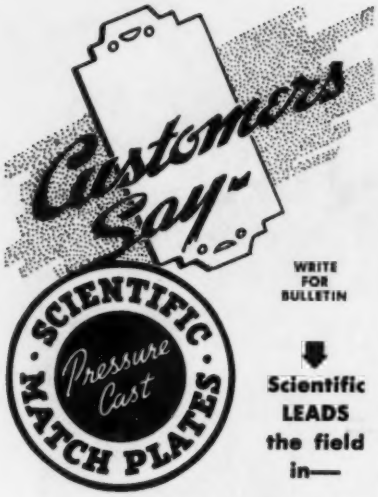
For more data, circle No. 583 on postage-free Reader Service data, p. 17 or 18



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PRECISION . . . QUALITY AND SERVICE

THE SCIENTIFIC CAST PRODUCTS CORP.

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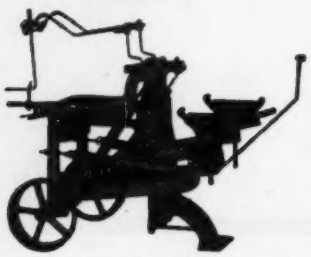
INTERNATIONAL

MACHINE of the MONTH

TYPE "R"



The International Type "R" Machine is one of the most versatile machines made for core work. Made in ten sizes—14" x 8" up to and including 24" x 10" draw. Type R is a hand ram, hand turnover, foot draw machine. Designed by experienced foundry engineers who have a practical working knowledge of the foundry business.

Send for Bulletin "R" today

INTERNATIONAL MOLDING MACHINE CO.
La Grange Park, Illinois

For more data, circle No. 585, p. 17-18

The First Casting

Foundrymen have speculated for many years as to how the first casting was made and who made it. In the case of Harold E. White, such speculation inspired a poem.

With a background in melting inherited from his father, a gold and silversmith for whom he pulled bellows after grade-school hours, he studied metallurgy at Lehigh University and graduated in 1916, specializing in electric furnace design. He spent six years with Norton Co. in Germany, South America, and Canada, five years with Southern Manganese Corp. in Anniston, Ala., finally joining Lava Crucible-Refractories Co., Pittsburgh, Pa., where he's been for 27 years and is now vice-president in charge of research and development.

He passes his poem on to AMERICAN FOUNDRYMAN readers by way of Bob Kennedy, AFS secretary emeritus, who was manning the Old Timers desk at the 1954 AFS Convention, when White registered for his 25-year pin.

The First Casting

Out of the gloomy realm of darkness,
Groping for the light,
Emerged our savage forbear
From the prehistoric night.
From out his mental jungleland
He crept toward meads of thought,
Progress was the path he chose,
Self pride the goal he sought.
He left his tree-top dwelling place—
It was not weatherproof,
And built himself a hut of stone
And made a green-thatched roof.
How primitive his weapons were!
A root with bludgeoned end,
A jagged stone, a rough-hewn club—
These himself to defend.
Physical phenomena taught him
The nature of fire,
Trees kindled by a lightning stroke,
Volcanoes veting ire.
He struck some sparks with flint
Upon a batch of sun-dried grass,
And fanned the tinder into flame.
Fire came to pass!
To hold this hard-won victory—
And lest the fire chill,
He crudely formed a wall of stone,
Gathered from a hill.
At first he used no mortar,
But found on a later day
His fire burned much brighter
If he lined the walls with clay.
One day the fire burned hotter still,
Enflamed by winds that roared,
When from a piece of blue stone
Molten metal, glistening, poured.
The metal known as copper now
Was thought a fiend or god
By him who watched it boil and course
Around a fire-burnt clod.
He quickly cut a channel
To a level bit of sand;
The shining metal flowed into
The figure traced by hand.
Unrehearsed the drama
As nature set the stage,
So were the curtais opened
On a brave metallic age.

VIBRATION for STUCK MATERIALS

The small, portable CLEVELAND Type VG vibrator is a highly versatile unit. A sturdy, clamp-on vise enables easy attachment to such applications as concrete forms and molds.

The Type VG is ideal wherever a clean, sharp finish is desired.

Tell us your materials handling problem, or write for our detailed literature.

AIR and ELECTRIC

2786 Clinton Avenue • Cleveland 13, Ohio

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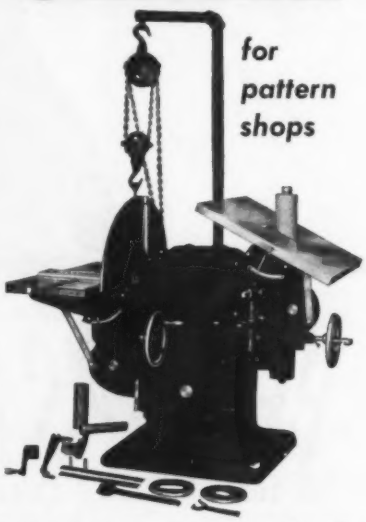
"OLIVER"

30-inch Disk and Spindle

SANDER

for pattern shops



Sands patterns — knots, cross or end grains, screws, nails, etc. Both tables tilt 45°. Disk table adjustable vertically. Takes spindles 2", 3", 4" diameter, 9" long. Has duplicating and circle sanding attachments. Also made as a double disk and double spindle sander. Write for folder No. 34.

OLIVER MACHINERY COMPANY
Established 1890 GRAND RAPIDS 2, MICH.

For more data, circle No. 587, p. 17-18

Chapter Meetings

October

1 . . Western New York
Hotel Sheraton, Buffalo, N. Y. H. G. Robertson, American Steel Foundries, Alliance, Ohio, *"What AFS Has to Offer Management."*

4 . . Chicago
Chicago Bar Association, Chicago. Allen A. Evans, Motor Truck Div., International Harvester Co., Indianapolis, Ind., *"Practical Applications of Foundry Quality Control."*

4 . . Metropolitan
Essex House Hotel, Newark, N. J. Charles W. Mooney, Jr., Supt., Olney Foundry, Link Belt Co., Philadelphia, *"Cores."*

7 . . Saginaw Valley
Fischer's Hotel, Frankenmuth, Mich. 10th Anniversary Meeting. Charles Morrison, Consultant, *"European Foundry Experiences."*

8 . . Birmingham
Tutwiler Hotel, Birmingham, Ala. Two Panel Discussions: Ferrous, J. E. Reynolds, U. S. Pipe & Foundry Co.; Nonferrous, L. H. Durdin, Dixie Bronze Co., Inc., *"Melting and Molding."*

8 . . Northern California
Sequoia Country Club, Oakland, Calif. Annual Northern California Foundrymen's Golf Tournament.

8 . . Eastern Canada
Mt. Royal Hotel, Montreal, Canada. S. L. Gertsman, Head, Steel & Foundry Section, Canadian Bureau of Mines, *"Desulphurization of Steel and Iron."*

8 . . Wisconsin
Schroeder Hotel, Milwaukee. Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, *"High Pressure Molding."*

11 . . Michiana
Whitcomb Hotel, St. Joseph, Mich. Charles F. Walton, Gray Iron Founders' Society, Inc., *"Gating and Risering of Castings."*

11 . . Timberline
Oxford Hotel, Denver, Colo. Telfer E. Norman, Climax Molybdenum Co., *"Climax Operations and Further Uses for Molybdenum."*

12 . . Northern Ill. & Southern Wis.
Beloit Country Club, Beloit, Wis. Robert Zoller, president, Zoller Casting Co., Bettsville, Ohio. *"A New Era in Cupola Melting."*

12 . . Twin City
Covered Wagon, Minneapolis. Panel Discussion: C Process, Louis Pedicini, Archer-Daniels-Midland Co., Minneapolis; D Process, F. S. Brewster, Harry W. Dietert Co., Detroit; P Process, Richard W. Heine, Dept. of Mining & Met., University of Wisconsin, Madison, Wis.

13 . . Mo-Kan
Fairfax Airport. Walter R. Jaeschke, consulting met. engr., Whiting Corp., Harvey, Ill., *"Cupola Operation."*

continued on page 102

CASTINGS GLITTER LIKE

WITH

ASBURY

Diamond Blacking

An all purpose Core and Mold Wash for Sand Castings, Permanent Molds and Ingots

FOR QUALITY PRODUCTS
THE ASBURY GRAPHITE MILLS, INC.
ASBURY NEW JERSEY
CHICAGO SAN FRANCISCO NEW YORK BOSTON

SPECIALISTS FOR
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IMPORTERS, REFINERS AND GRINDERS OF GRAPHITE OF ALL TYPES FROM ALL OVER THE WORLD

For more data, circle No. 588 on postage-free Reader Service card, p. 17 or 18

GOOD CASTINGS

ARE NOT THE RESULT
OF LUCK
CLOSE CONTROL OF PRACTICE
IS THE ANSWER
MOISTURE CONTROL OF SANDS
IS THE BUGABOO

THE SPEEDY MOISTURE TESTER *is the answer*

Tests can be made at molding or core sand mixers, or on the floors.

Time required for a test 35 seconds.

Gives only free moisture reading. Does not volatilize oil, binders or impregnating agents.

Anyone who can read can operate instrument.

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For Foundry Practice—

- DOMESTIC & AUSTRALIAN ZIRCON FOUNDRY SANDS
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- Foundry Supply Co. Inc., Minneapolis; St. Paul
- Canadian Foundry Supplies & Equip.

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CUT STEEL

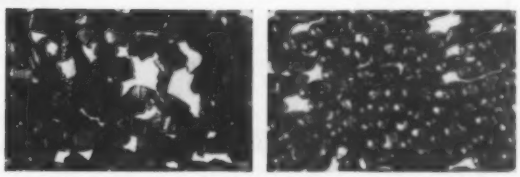
SLASHED OUR CLEANING COSTS AS MUCH AS 65% PER WHEEL-HOUR

The above cost analysis figure was included in a report recently received from a prominent manufacturer of farm equipment, one of the first users of Metal Blast's new CUT STEEL abrasive. The report also states that CUT STEEL produced a better finish than ever obtained before.

CUT STEEL is an entirely new type of abrasive. It is composed of small particles cut from high grade alloy steel. It work-hardens in use—actually becomes harder the longer it's used.

For scores of foundries, it is cleaning faster, better and lasting longer than any other abrasive. Yet, Grade "A" CUT STEEL costs *less than most cast steel shot*, and Grade "B" *no more than malleable shot*.

If you're concerned about cleaning costs and the appearance of your castings—by all means investigate CUT STEEL! Samples, literature, trial orders gladly, on request.



CUT STEEL changes shape in usage. Its original form is grit-like, with sharp edges and corners. But in production, it rapidly changes to a spherical shape, in a variety of sizes. The smaller pellets contribute to its efficiency by penetrating to even the hardest-to-reach parts of castings.

SOONER OR LATER, YOU TOO, WILL CHANGE TO CUT STEEL

METAL BLAST, Inc.

872 EAST 67th ST., CLEVELAND 3, OHIO

manufacturers of ANNEALSHOT, SUPER-ANNEALSHOT, CUT STEEL ABRASIVES

Chapter Meetings

continued from page 99

14 . . St. Louis
York Hotel, St. Louis. Hans J. Heine, AFS Technical Director, *"Casting Design."*

15 . . Texas
San Antonio, Texas. Guest speaker Charles K. Donoho, American Cast Iron Pipe Co. Color film, *"Production of Centrifugally Cast Steel Tubes."* General discussion, *Iron and Steel Metallurgy and Foundry Practices."*

15 . . Southern California
Rodger Young Auditorium, Los Angeles. Albert L. Kreuer, Western Div., Orefraction, Inc., Pittsburgh, Pa., *"Zircon Sand."*

15 . . Central New York
Mark Twain Hotel, Elmira, N. Y. Technical Session. Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., "High Pressure Molding."

18 . . Northern California
Shattuck Hotel, Berkeley, Calif. Albert L. Kreuer, Western Div., Orefraction, Inc., Pittsburgh, Pa., *"Zircon Sand."*

18 . . Quad City
Guest speaker, Clarence W. Culbertson, Great Lakes Carbon Corp. Sound-color film on manufacture of foundry coke.

19 . . Eastern New York
W. A. Hambley, Chas. A. Krause Milling Co., *"Casting Defects."*

20 . . Central Michigan
Hart Hotel, Battle Creek, Mich. John G. Kura, Battelle Memorial Institute, *"Effect of Gating Practice."*

November

4 . . Saginaw Valley
Fischer's Hotel, Frankenmuth, Mich. Thomas A. Lawton, Buick Motor Div., General Motors Corp.

12 . . Birmingham
Jefferson Davis Hotel, Anniston, Ala. Panel discussion: Chairman, Frank H. Coupland, Jr., American Cast Iron Pipe Co. *Sands and Their Uses in the Foundry.*

12 . . Eastern Canada
Mt. Royal Hotel, Montreal, Canada. Past Chairmen's Night. A. E. Cartwright, Crane, Ltd., Montreal, Canada. *"Some Reflections on and Experiences in Melting and Pouring Bronze."*

12 . . Southern California
Rodger Young Auditorium, Los Angeles. Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, *"Pressure Molding."*

15 . . Quad City
Hans J. Heine, AFS Technical Director, *"The Foundrymen's Most Unused Tool."*

15 . . Northern California
Shattuck Hotel, Berkeley, Calif. Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, *"Pressure Molding."*

OTTAWA
SILICA SANDS

A two letter word describing the spirit of America — the button our pioneering forebearers pushed, then forgot about the one marked "STOP". We got that way by doing things right and the foundryman stresses quality today more than ever.
Thats why he has come to depend on Ottawa's consistent uniformity and purity.

When you need shell molding sand, try Ottawa Silica's SIL-CO-SHELL

Two of the nation's trunk line railroads serve Ottawa Silica Company's transportation needs, assuring you of swift and dependable service.

OTTAWA
SILICA COMPANY
PLANTS LOCATED IN
OTTAWA, ILL. AND ROCKWOOD, MICH.

SERVING THE FOUNDRY, GLASS, CERAMIC AND CHEMICAL INDUSTRIES FOR OVER 50 YEARS

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use KING PORTABLE
BRINELL HARDNESS TESTERS

They are ACCURATE—VERSATILE—can be carried easily and used almost anywhere.

The King Portable Brinell Hardness Tester offers these advantages:

It puts an actual load of 3000 kg on a 10 mm ball.
Intermediate loads can also be obtained.
It can be used in any position—even upside down.
It is equally accurate as portable or stationary equipment.
The test head is removable for testing larger pieces beyond the capacity of the standard base.

Specifications: Throat, 4" deep with base, unlimited without base; Gap, 10", 13" high or unlimited.
Weight, 26 lb.

Write for full details today.

ANDREW KING
Box 606-S Ardmore, Pa.

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JUST A HABIT

Now swearing is only a habit
And we fail to see the objective
In filling the atmosphere of the shop
With expletives and invective.
For instance, suppose there's a big job to make
And your helper is off on a jag,
Is cursing and swearing and raising the roof
Gonna help you to finish that drag?
No use to stand there repeating bad words,
Might as well get in it and ram it.
Though you turn the air blue, you've still got it to do
So there's no use in cussing—dammit!

From *Rammed Up and Poured*, popular book of foundry poems by Bill Walkins. Book can be obtained from the copyright owners: Electric Steel Foundry Co., 2141 North West 25th Avenue, Portland 10, Oregon. Price is $1.85.

Bill Walkins, the foundry bard, author of the poems published in Rammed Up and Poured which are being republished in American Foundryman has been named an Associate editor of The Esco Ladle of Electric Steel Foundry Co., Portland, Oregon. Prefers his old title of sand mill operator, he says, but is going along with the change.

Classified Advertising

For Sale, Help Wanted, Personals, Engineering Service, etc., set solid..20c per word, 30 words ($6.00) minimum, prepaid. **Positions Wanted** ..10c per word, 30 words ($3.00) minimum, prepaid. Box number, care of *American Foundryman*, counts as 10 additional words.

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HELP WANTED

FOUNDRY SUPERINTENDENT. For progressive semi-mechanized foundry in Indiana. Pouring 40 to 45 tons per day. Gray iron. Squeezer and cope and drag work. Casting weight 8 lbs. to 300 lbs. Man must be capable of controlling scrap and improving quality. Age required 35 to 45 years. Excellent opportunity for right man. **Box B55, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

FOUNDRY GENERAL MANAGER. For foundry located in central Illinois. Must be capable of supervising overall operations in foundry which has a capacity of 80 tons per day. Completely mechanized. Squeezer, cope and drag, and sand slinger. Casting range from 10 lbs. to 400 lbs. Age required 35 to 45 years. **Box B56, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

PRODUCTION MANAGER. Modern, medium-sized steel jobbing foundry requires experienced Production Manager to take charge of production department. Must be experienced in production scheduling, follow-up and customer relations. The right man can look forward to a permanent career with a progressive, expanding organization in the Metropolitan New York area. **Box B58, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

SALES REPRESENTATIVES WANTED. Aluminum Sand and Permanent Mold Foundry wants qualified casting salesman. Commission basis. Open area in Midwest. **Write Box B54, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

PLANT ENGINEER

Must have experience in steel foundry to take charge of both construction and all maintenance. In replying give complete information which will be held in strict confidence by a single executive.

Box B57
AMERICAN FOUNDRYMAN
616 S. Michigan Ave.
Chicago 5, Ill.

METALLURGIST with foundry experience in production of top quality alloy steels to aircraft specifications. Position with East Coast plant of a nationally known Investment Casting Manufacturer. Address replies submitting full résumé to **Box AF 1081, 221 W. 41st St., New York 36, N. Y.**

FOREMAN for Pressure Cast Plaster plant situated in Midwest. Must have experience. Excellent opportunity for right man. Give full details. Reply to Box B52, **AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

RESEARCH METALLURGIST to head development work on iron and steel rolls in Pittsburgh District. Excellent opportunity. Salary open. **Box B53, AMERICAN FOUNDRYMAN, 616 S. Michigan Ave., Chicago 5, Ill.**

FOUNDRIES FOR SALE OR LEASE

INDUSTRIAL FOUNDRY MFG. CO. Complete gray iron foundry, fireproof 12" concrete block building, rail siding, 2 acres of land. Nets over $50,000 annually. Property appraised at $55,000, equipment at $33,000. Sale price is a give-a-way! **Write: E. BOND & CO., 333 N. Michigan Ave., Chicago, Ill. Ask for K-7154.**

17,000 Sq. Ft. Foundry

FOR SALE OR LEASE

Gray Iron - Aluminum - Bronze

- **80' x 210' Building**
- **On 5 Acres**
- **Railroad Spur**
- **6-Ton Cap. Cupola**
- **200 Tons per Month**

Present Owner will take 25% to 50% of Production

Present owner selling in order to concentrate on manufacturing. Ample business available to take up remaining 50% to 75% of production.

Contact: Frank Wheatley, Jr.
Frank Wheatley Pump and Valve Mfr.
Hale Station, Sand Springs Road
TULSA, OKLAHOMA

For Sale or Lease

New York Central Railroad will consider bids for one Whiting Standard No. 7 Cupola and Accessories located in Foundry Building at Elkhart, Ind. Equipment installed new in 1950. Contact W. H. Gilbert, Superintendent Foundry, Elkhart, Ind., for inspection. Will consider bids for both building and equipment or equipment only. Subject to prior sale or other disposition. Specifications forwarded upon request. **Contact A. L. Prentice, Vice President Purchases, 466 Lexington Ave., New York 17, N. Y.**

EQUIPMENT FOR SALE

FURNACES FOR SALE

10 used Heat Treating Furnaces, and two 7-ton gantry cranes, good condition, priced to sell.

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Boise, Idaho

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CANADIAN GRAY IRON FOUNDRY AVAILABLE. Modern, fully equipped Canadian foundry located in the heart of industrial Ontario wishes to associate with an American company desirous of manufacturing in Canada; or alternatively we wish to acquire manufacturing rights in Canada for one or more of your products. There are great possibilities in this association for a company able to provide some scientific and technical assistance. **Apply to Box B59, AMERICAN FOUNDRYMAN, 616 South Michigan Avenue, Chicago 5, Ill.**

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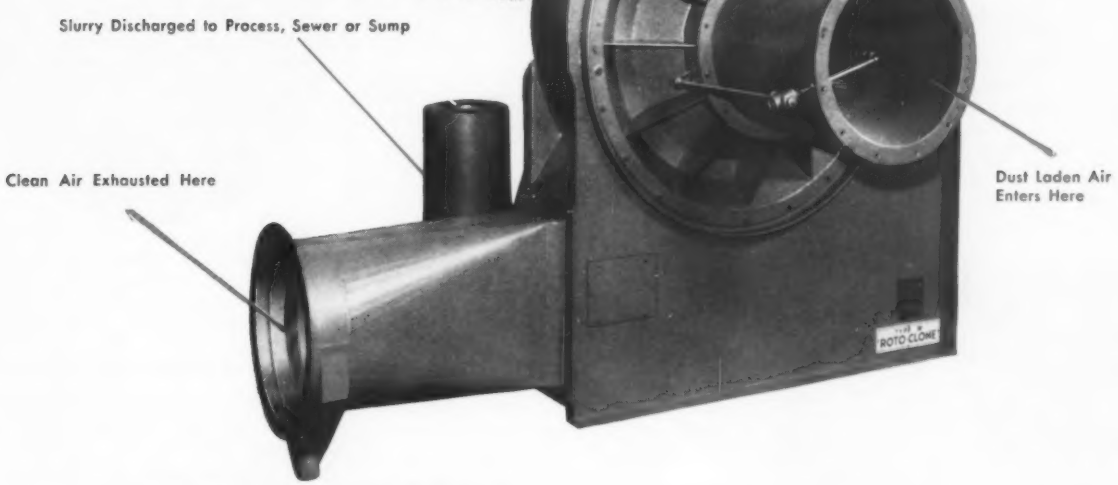

Type W ROTO-CLONE design makes it the lowest priced, high efficiency wet dust collector in its class

Why is ROTO-CLONE lower priced? The Type W is strictly a product of AAF research—features a patented design that combines high efficiency with inexpensive construction. Result—the lowest priced wet dust collector in its class (units of 1,500 to 50,000 cfm capacity designed for high efficiency dust collection, including extreme fines).

Why are space requirements less? ROTO-CLONE provides everything you need, except duct connections, in one complete, shop-assembled package—high efficiency collector, exhauster, motor and drive. This compactness makes its relocation easy and economical with change in process, plant layout or production equipment.

Why is performance outstanding? Ingenious addition of water sprays extends the effectiveness of this dynamic precipitator to the collection of the finest, lightest dust particles. Unit requires little maintenance; uses a minimum of water and maintains efficiency regardless of variation in air volume.

For complete information, call your local AAF representative or write direct for Bulletin 274.

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American Air Filter
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Advertisement

ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Welland, Ontario

Why 3 Per Cent Chrome Steel Makes Good Castings for Wear Resistance

Castings of 3 per cent chromium steel have been used in substantial tonnages, for many years, for various equipment parts demanding good wear resistance. Such castings offer an excellent combination of hardness and toughness. Typical applications are crusher parts used in rock- and ore-crushing equipment, swing hammers for pulverizing coal, railroad switch frogs, gears, pulleys, sheaves, and other castings that must meet severe conditions of wear.

Fig. 1. Railroad switch frogs, which are subject to severe wear, give outstanding service when cast of 3 per cent chromium steel.

The 3 per cent chromium steels, are normally produced in a carbon range of 0.30 to 0.50 per cent. They exhibit excellent depth-hardening properties, which simplify heat-treatment and insure uniformity throughout heavy sections. The analysis is usually modified by a molybdenum addition, since this element aids in increasing hardenability.

Fig. 2. Grating for top of shake-out machine is cast of 3 per cent chromium steel to give good wear resistance and long life.

Properties Improved by Heat-Treatment

The best properties of 3 per cent chromium steels are developed through heat-treatment. Generally, this consists of a normalizing treatment from 1650 deg. F., followed by tempering in a range between 1000 and 1250 deg. F., depending on the physical properties desired. Double normalizing is sometimes used to obtain further improvement in the grain structure. With carbon on the high side of the specification, air-quenched castings show a Brinell hardness number of over 400 in 3-inch sections. This hardness is practically uniform throughout the section. Oil quenching is employed to produce higher hardness and depth of penetration, and even in a 4-inch section, a hardness number of over 500 Brinell is obtained.

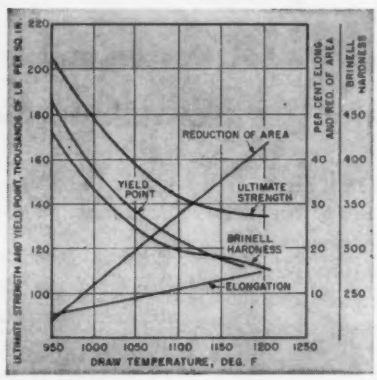


Fig. 3. These curves show the response to tempering of a 0.37 per cent carbon, 2.93 per cent chromium, 0.35 per cent molybdenum steel previously normalized from 1650 deg. F.

The steel also shows good response to tempering. After a normalize and a 1100 deg. F. treatment, it has a tensile strength close to 150,000 pounds per square inch, with an elongation value of about 12 per cent, and a Brinell hardness of about 300. When greater ductility is required, tempering should be done at higher temperatures. However, in such instances, some strength and hardness are sacrificed.

Fig. 4. Photomicrograph of 3 per cent chromium steel normalized from 1650 deg. F. and tempered at 100 deg. F. (X250). The pseudo-martensitic structure is well suited to resist abrasion.

Effect of Other Alloy Additions

Molybdenum in the range from 0.30 to 0.50 per cent will improve depth-hardening characteristics and aid in reducing susceptibility to temper brittleness in the lower temperature ranges. If the molybdenum-bearing steel contains relatively high carbon (0.40 to 0.60 per cent) additions of approximately 0.08 to 0.10 per cent vanadium provide greater uniformity in hardening. Small additions of silicon increase strength and hardness and this element is sometimes increased to 0.80 or 1.00 per cent. Manganese is added in amounts between 0.50 and 0.80 per cent.

Metallurgical Service Available

When you have occasion to produce castings for applications involving severe abrasion and wear, it will pay you to investigate the advantages of using 3 per cent chromium steel. If you need help on some specific metallurgical problem, be sure to consult one of ELECTROMET's specially trained metallurgists and engineers. For further information, write to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

The term "Electromet" is a registered trademark of Union Carbide and Carbon Corporation.

For more data, circle No. 575 on postage-free Reader Service card on p. 17 or 18

WHERE ACCURACY COUNTS...

LINOIL

SCORES A DIRECT HIT!

Core assembly is shown in stages from front to rear. Stacked body cores are secured by steel rods. Barrel cores are inserted after first five body cores have been assembled.

49 inch shell has maximum diameter of 11 inches. 1500 pounds of metal is poured into each mold to obtain a finished casting weighing 600 lbs. High precision cored cavity is shown at right.

UNIQUE CAST ARTILLERY SHELLS ARE HELD TO CRITICAL DIMENSIONS AT

AUTO SPECIALTIES MFG. CO.

(RIVERSIDE CRANKSHAFT DIV.)
ST. JOSEPH, MICHIGAN

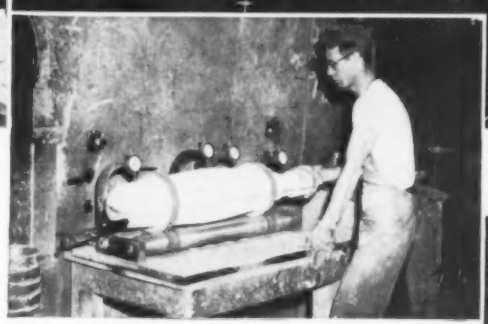
Aberdeen Proving Grounds, after testing cast artillery shells, concluded that no other means of shell manufacture had been proven to an equal degree of accuracy...5 rounds within a 29-yard square at 23,000 yards range.

The Riverside Crankshaft Division of Auto Specialties Mfg. Co. has proven the extreme accuracy of cast shells beyond a doubt.

The 280 mm. shell illustrated is a core job inside and out . . . from start to finish. Molds are made up of baked cores stacked 18 high while the cavity is formed by a barrel core held to the exacting concentricity of ± .025 inches.

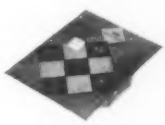
In cases like this, where the precision of the work is dependent upon the cores . . . and core accuracy is the prime target, LINOIL scores a direct hit! . . . as proven by Auto Specialties. Every batch of mix, whether for barrel, body or gating cores, uses rigidly controlled volumes of LINOIL. The uniformity of LINOIL eliminates the need for varying mixtures and plays a vital role in quality control.

Your LINOIL man will help you select specific-purpose core oils to answer your problems. Call him today, or write to ADM at the address below.



Barrel cores are made of halves pasted together . . . then tested for concentricity tolerance of ± .025.

Molds, when assembled are 84 inches high. Pouring requires catwalks and special clothing for safety.



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ALUMINUM ALLOY

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In your profit-minded operation there's a definite place for the versatile, economical applications of Apex Z-33.

Send without obligation for information covering complete specifications and properties of Apex Z-33.

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